UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DETAILED DESCRIPTIONS OF THE UPPER CRETACEOUS SUSSEX SANDSTONE IN FIVE COREHOLES, POWDER RIVER BASIN, WYOMING

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OPEN-FILE REPORT 88-420

This report is preliminary and has not been reviewed for conformity to U.S. Geologic l Survey editorial standards or stratigraphic nomenclature.

1 USGS, DENVER, CO 80226

1988

These core descriptions of the Sussex sandstone in five Powder River Basin, Wyoming coreholes are intended to show vertical stratigraphic relationships and trace fossil assemblages at these locations.

The Sussex sandstone of the Upper Cretaceous Cody Shale is composed of marine shelf sandstones and siltstones. Oil is produced primarily from the ripple-laminated and planar and trough cross-bedded offshore bar sandstones which are present near the top of some Powder River basin Sussex core and outcrop sections.

Condensing the core descriptions required abreviating many words; examples are SA and SR for sub-angular and sub-rounded, VLT and MED-GY MS for very-light and medium-gray mudstone. Where space was available on the forms the terms were not shortened. A source for trace fossil descriptions is A. Seilacher (1978), Use of trace fossils for recognizing depositional environments; in Trace fossil concepts; SEPM Short Course no. 5, pp. 175-201.

The core is stored at the U.S. Geological Survey core library in Lakewood, Colorado under the core number listed at the top of the description forms. Well names and locations and text locations of the five described coreholes are:

	(PAGE NUMBERS)
1) No. 1 Empire-Federal "C", SW NW Sec. 29, T45N, R75W, Campbell Co., WY, Woods Petroleum Corp., Sussex core depths 8,002-8,048 ft	4-8
2) No. 1 Mandell Federal, NE NW Sec. 22, T44N, R73W, Campbell Co., WY, Woods Petroleum Corp., Sussex core depths 8,157.9-8197.5 ft	9-14
3) No. 1 Red Unit, C NW Sec. 26, T48N, R79W, Johnson Co, WY, Woods Petroleum Corp., Sussex core depths 9,029-9,089 ft	15-21
4) 15-30 Scott Federal, SW SE Sec. 30, T36N, R71W, Converse Co., WY, Buckhorn Petroleum, Sussex core depths 9,794-9,877.1 ft	22-28
5) No. 1-11 Ucross State, NE SW Sec. 11, T52N, R81W, Johnson Co., WY, Marathon Oil Co., Sussex core depths 8,236-8,279 ft	29-32

EXPLANATION

MEASUREMENTS ARE IN FEET (') OR DECIMAL FEET AND INCHES (")
THE COLUMN MARKED "ENERGY" ON THE DESCRIPTIONS REFERS TO
RELATIVE VERTICAL CHANGES IN DEPOSITIONAL ENERGY CONDITIONS
BASED ON BEDFORMS AND BIOLOGIC ACTIVITY, BOTH FOR SMALL AND
FOR LARGE CORE SECTIONS.

LIST OF ABREVIATIONS

ROCK UNITS

SA = SUBANGULAR SS GRAINS, SR = SUBROUNDED SS GRAINS,
R = ROUNDED SS GRAINS,
FW = FAIRLY WELL (SORTED), P-F = POOR TO FAIR (SORTED),
W = WELL (SORTED),
MED-GY = MEDIUM GRAY, VLT, LT-BRN = VERY LIGHT, LIGHT BROWN,
VF = VERY-FINE (GRAINED SANDSTONE), F = FINE (SANDSTONE),
M = MEDIUM (SANDSTONE), C = COARSE (SANDSTONE),
SS = SANDSTONE, SLT = SILTSTONE, MS = MUDSTONE, CLY = CLAY,
D = MUDSTONE DRAPE, BLEBS = AMORPHOUS ROUNDED SANDSTONE OR
SILTSTONE LENSES

GENERAL

ABUN = ABUNDANT, DIA = DIAMETER, FX = FRACTURED,
$CaCO_3$, CARBONATE = CALCIUM CARBONATE, EST = ESTIMATED,
MOD = MODERATE, OSTN = OIL STAINED, TH = THICK,
,EDDED = CROSS-BEDDED

SYMBOL DESCRIPTION

MAJOR BOUNDARY DIVISIONS BETWEEN DESCRIBED CORE

DETAILED DESCRIPTIONS WITHIN MAJOR BOUNDARIES SHORT DASHED LINE.

CORE MISSING

UPWARD, DOWNWARD (AS IN DECREASING DOWNWARD)

MUDSTONE

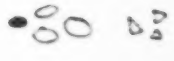
MUDDY SANDSTONE, SILTSTONE

SANDSTONE

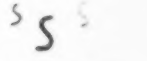
TROUGH CROSS-BEDDING

PLANAR TABULAR CROSS-BEDDING

RIPPLE LAMINATION



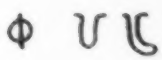
CLAY CLASTS, CHERT CLASTS



BIOTURBATION

HORIZONTAL BURROWS

TEICHICHNUS



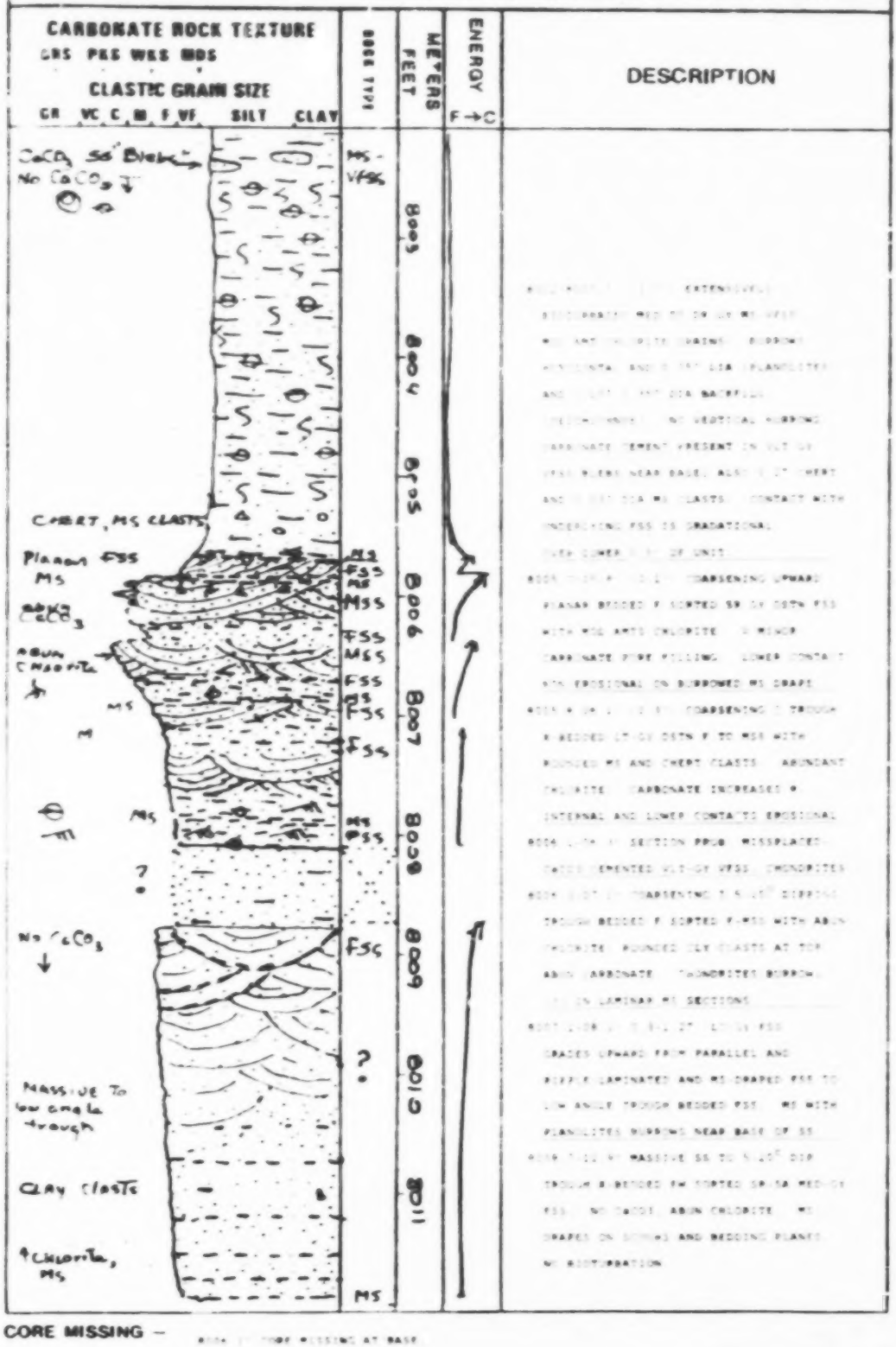
VERTICAL BURROWS

CHONDRITES

CORE NUMBER A-19

8002 TO 8019 FT

#1 EMPIRE-FEDERAL "C", SW NW SEC. 29, T45N, R73W, CAMPBELL CO, WYO.
WOODS PETROLEUM CORP., 4,895' KB ELEV., 8,002-8,048' CORE DEPTHS



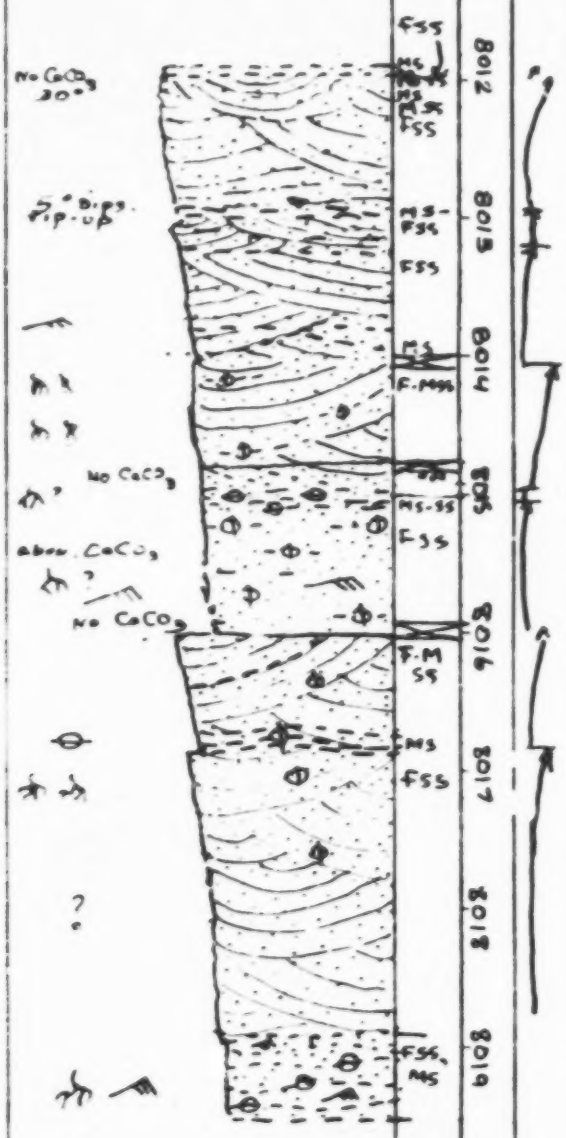
CORE MISSING –

#1 EMPIRE-FEDERAL "C", SW NW SEC. 29, T45N, R73W, CAMPBELL CO, WYO.
WOODS PETROLEUM CORP., 4,895' KB ELEV., 8,00?-8,048' CORE DEPTHS

CARBONATE ROCK TEXTURE
GRS PKS WKS MDS

CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY

ROCK TYPE | METERS / FEET | ENERGY F→C | DESCRIPTION



8011.9-8014' (2.1' EST) DSTN BRN GY F SSS; MOD ANT CHLORITE, NO CaCO3; 15° DIP TROUGH X-BEDS AT TOP; ANGLE, ENERGY INCREASE UPWARD; MINOR PLANER BEDDING; MED-CO MS LAMINAE AND CLASTS ON BEDDING PLANES

8013.2-13.25' (.05') 15° DIP TROUGH BEDDING IN FSS WITH MS FLASER AND RIP-UP

8013.25-14' (EST) LOW ANGLE TROUGH X-BEDDED FSS, MINOR RIPPLE LAMINAE

8014-8014.9' (EST) AS 8011.9-8013.2' ABOVE - 15-20% CLAY-CEMENTED FSS, NO DSTN; INTERNAL SCOUR CONTACTS; MOTTLED SS, POSSIBLY CHONDRITES

8014.9-16' (EST) SS FILLED 0.02-0.05" DIA HORIZ BURROWS OR POSSIBLY CHONDRITES IN BIOTURB MS

8014-18.9' (EST) AS 8011.9-13.2' ABOVE MINOR TO MOD CHONDRITES, DECREASING UPWARD; LOW ANGLE SS TROUGHS, SCOUR CONTACTS; MS DRAPES, RIP-UP, AND CHLORITE GRAINS ON BEDDING PLANES

8018.9-19.5' CORE MISSING - WELL LOG CHARACTER SUGGESTS COARSENING UPWARD SEQ AS ABOVE

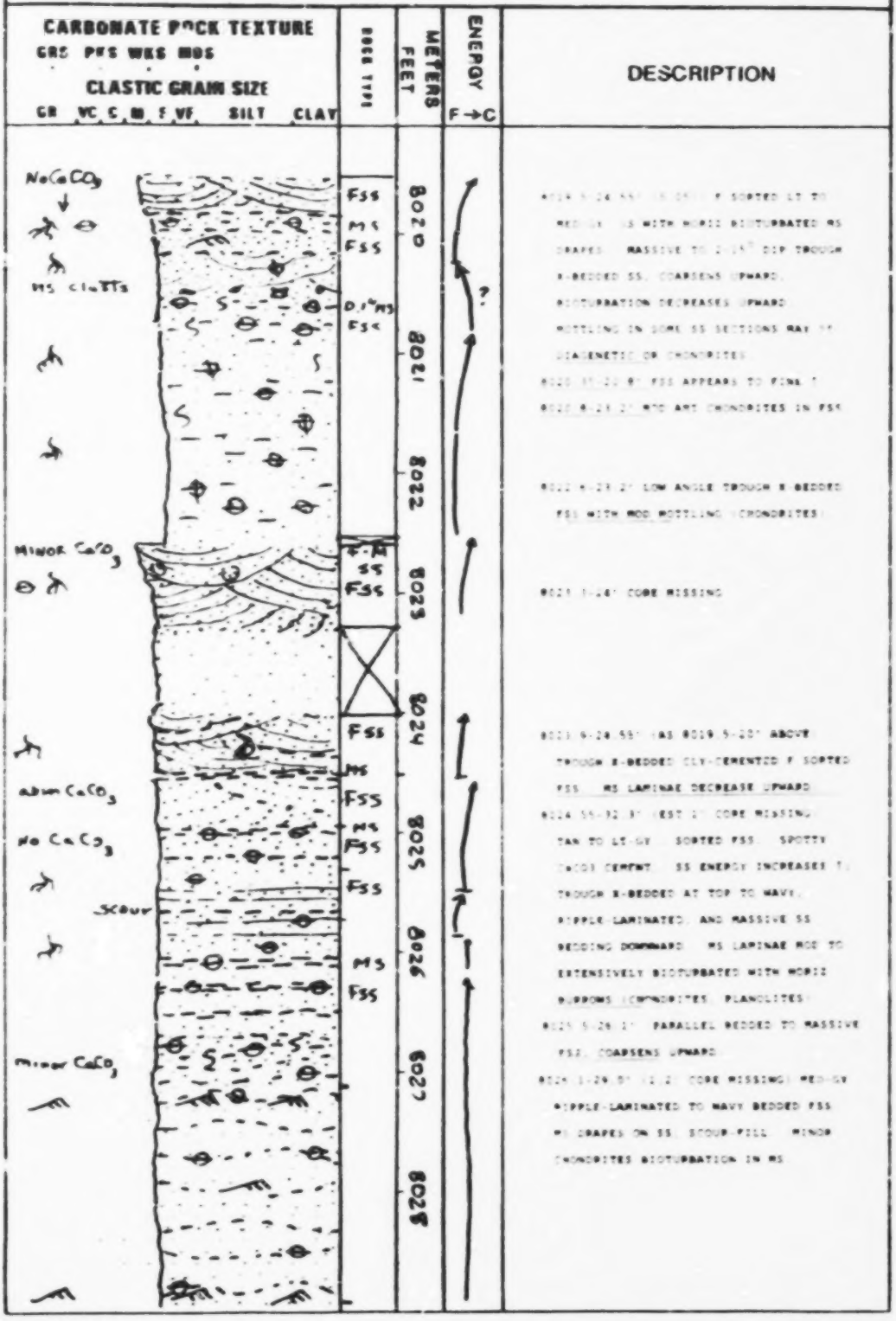
8018.4-18.9' (EST) SCOUR FILL AND RIPPLE-LAMINATED FSS WITH MODERATE CHONDRITES; INTERNAL WAVY, NON-EROSIONAL CONTACTS; MS DRAPES

CORE MISSING — UP TO 1.6' OF CORE MISSING
FOR EACH FOOT OF CORE
8011.9-8018.9' EST 1.1' MISSING

CORE NUMBER A419

8019.5 TO 8029 FT

#1 EMPIRE-FEDERAL "C", SW NW SEC. 29, T45N, R73W, CAMPBELL CO, WYO.
WOODS PETROLEUM CORP., 4,895' KB ELEV., 8,002-8,048' CORE DEPTHS

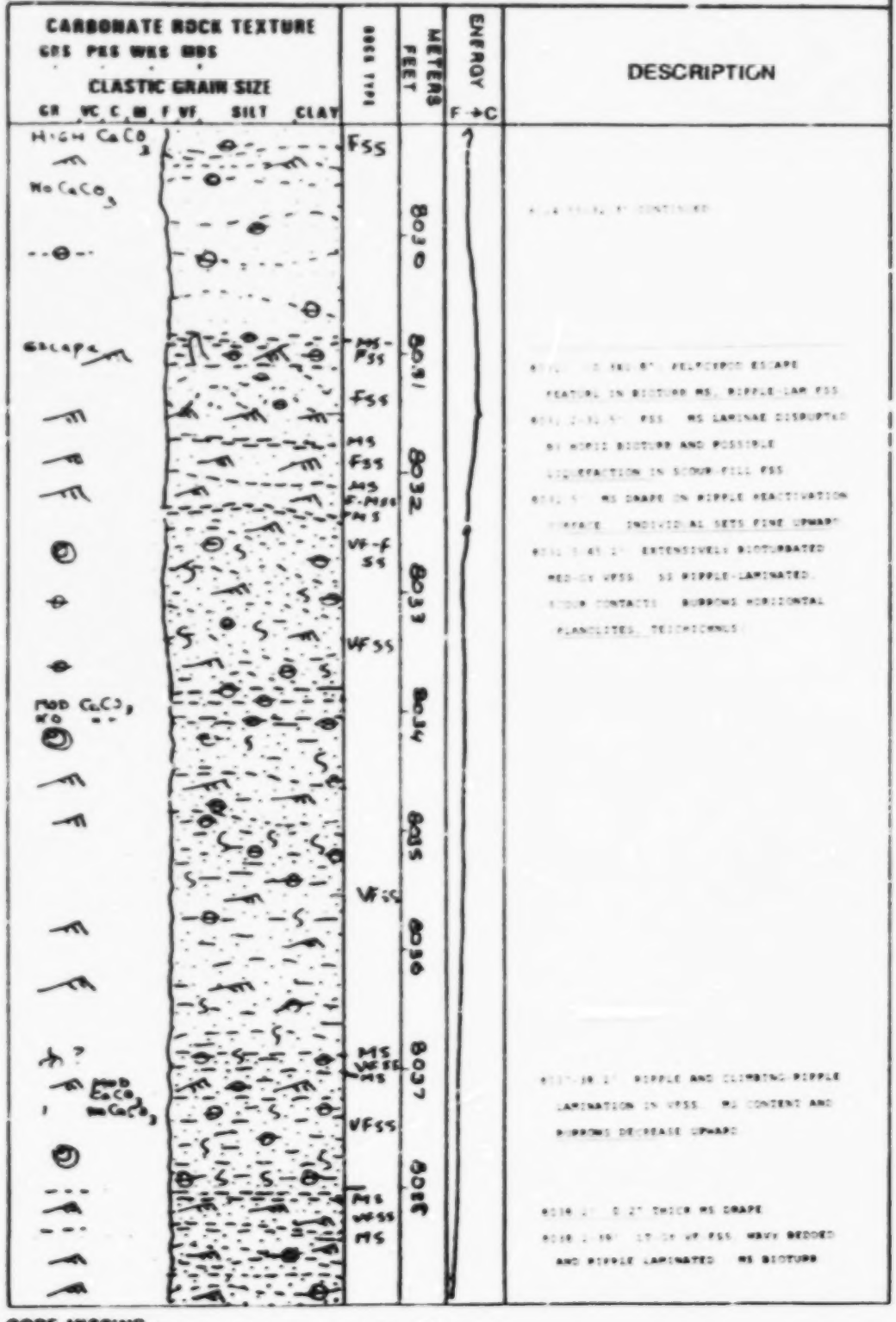


CORE MISSING — 8021 1-8021 9' 8 1' MISSING
8021 3-8021 [illegible] 8 1' MISSING
8027 7-8028 9' 2 2' MISSING

CORE NUMBER A-14

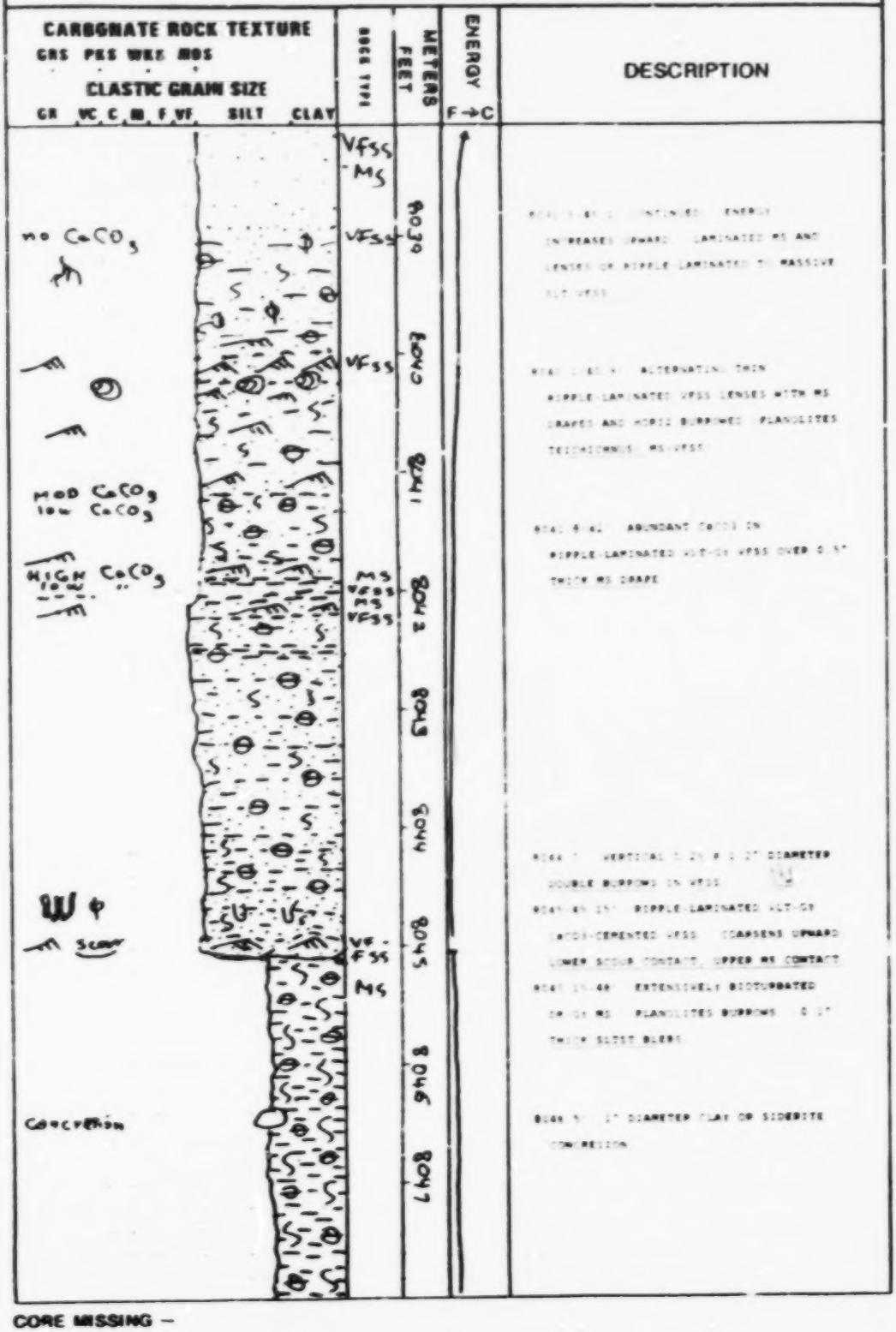
8029 TO 8039 FT

#1 EMPIRE-FEDERAL "C", SW NW SEC. 29, T N, R73W, CAMPBELL CO, WYO.
WOODS PETROLEUM CORP., 4,895' KB ELEV., 8,002-8,048' CORE DEPTHS



CORE MISSING –

#1 EMPIRE-FEDERAL "C", SW NW SEC. 29, T45N, R73W, CAMPBELL CO, WYO.
WOODS PETROLEUM Corp., 4,895' KB ELEV., 8,002-8,048' CORE DEPTHS



CORE MISSING –

CORE NUMBER A-22

PAGE 1 OF 1

8157 TO 8197 FT

GENERALIZED CORE DESCRIPTION WELL LOG DEPTH 7' DEEPER THAN CORE DEPTH

#1 MANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO.
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197.5' CORE DEPTHS

CARBONATE ROCK TEXTURE
GRS PKS WKS MDS

CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY

ROCK TYPE

METERS
FEET

ENERGY F→C

DESCRIPTION

8157.9-8160' (2.1') RED-GY MS-VFSS. COARSENS DOWNWARD SLIGHTLY WITH A TRANSITIONAL LOWER CONTACT WITH SS. ABUNDANT BIOTURBATION, HORIZONTAL SS-FILLED BURROWS. RED-GY MS BLK'S AND DRAPES.

8160-8169.8' (8.8') POORLY SORTED LT-GY VF-CSS WITH NUMEROUS FINING UPWARD SEQUENCES IN TROUGH X-BEDDED SCOUR AND FILL SANDSTONES. X-BEDS HAVE DIP ANGLES OF 10-30°. ABUNDANT MS AND CLYST RIP-UP CLASTS. NO SS BIOTURBATION. CLY CLASTS ARE TAN, UP TO 4" X 3" X 3", LYING ON TROUGH X-BEDDING, AND DISPLAY MINOR LAMINAR INTERNAL BEDDING. ABUNDANT F-M SIZED GRAINS OF CHLORITE AND/OR GLAUCONITE.

8169.8-8176' (6.2') LT-GY F-P SORTED F-MSS WITH MS DRAPES AND RIP-UP. VERY MINOR MS BIOTURBATION, HORIZONTAL BURROWS. BROAD LOW-ANGLE TROUGH X-BEDDING. MAX 10° DIP ANGLES WITH RIPPLE LAMINATED FSS.

8176-8178' (2') RED-GY TO TAN-GY F-MSS. VERY SLIGHT FINING UPWARD BEDDING MASSIVE, TROUGH X-BEDS AND MS RIP-UP CLASTS AT BASE. MS DRAPES ON TROUGH X-BEDDING PLANES.

8191.5-8193.5' (12') VF-FSS WITH MINOR MSS GRAINS. MASSIVE TO PLANAR (?) BEDDING WITH RIPPLE LAMINAE. SS FINES DOWNWARD. HORIZONTAL BURROWS (PLANOLITES) IN MS DRAPES.

8193.5-97.5' (4') RED-GY MS-VFSS. MODERATE BIOTURBATION IN HORIZONTAL SS-FILLED BURROWS - PLANOLITES.

RED TO DR-GY MS DRAPES ON LAMINAR AND RIPPLE LAMINATED RED-GY VFSS.

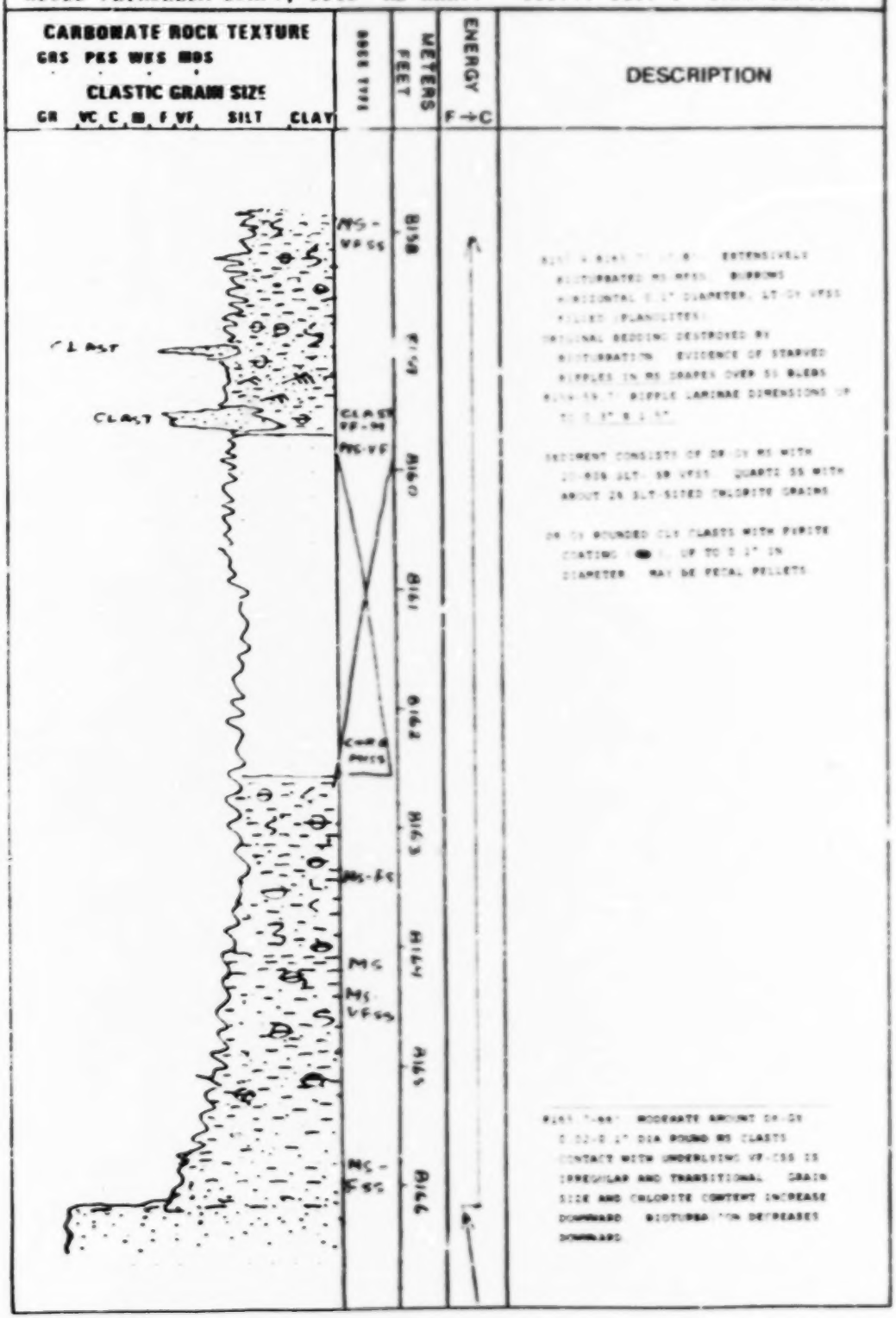
CORE MISSING - 8159.7-8162.9' (3.2')
8170-8181.0' (11.0')

CORE NUMBER A-22

PAGE 1 OF 2

8157.9 TO 8197.5 FT

#1 MANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197 5' CORE DEPTHS



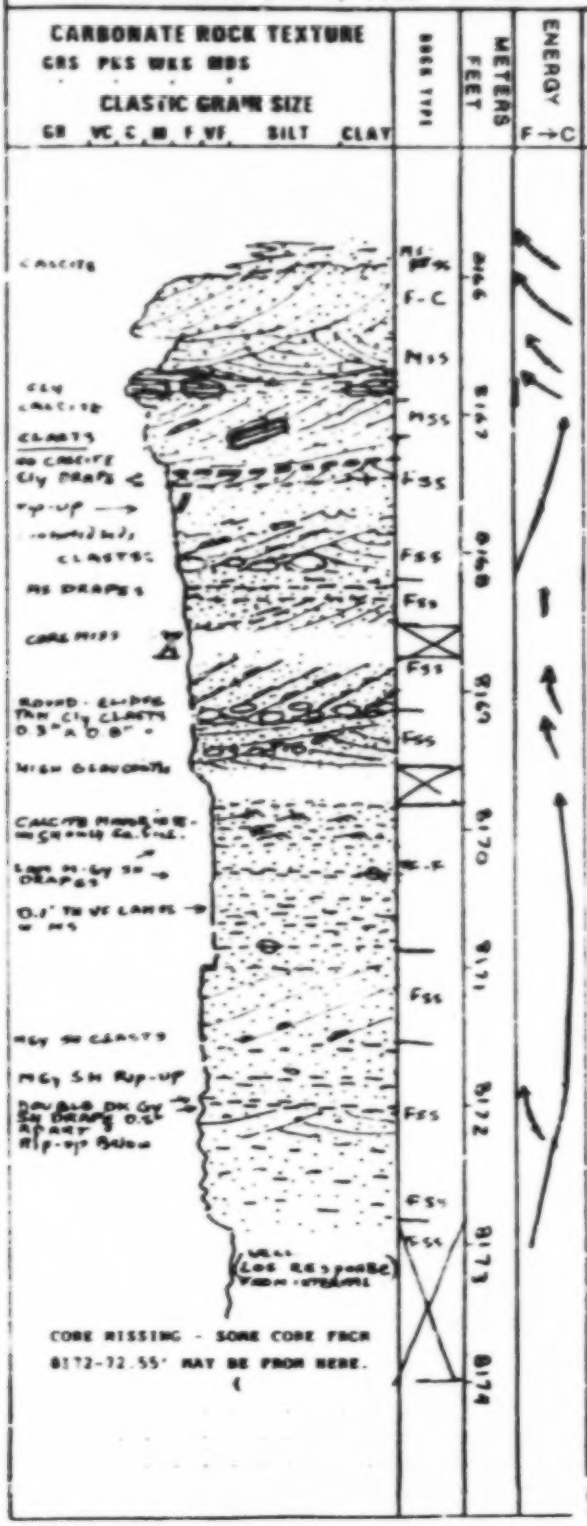
CORE MISSING –

CORE NUMBER A-11

11

8166 TO 8174 FT

#1 MANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197.5' CORE DEPTHS



8166-68.4' F SORTED LT-GY SR VF-CSS FINING UPWARD LOW ANGLE TROUGH X-BEDS. ABUNDANT CHLORITE CARBONATE CEMENT. MOD AMOUNT MS. PYRITE PELLETS.

8168.4-68.7' FW SORTED LT-GY SR MSS. SMALL SCALE TROUGH X-BEDS. EROSIONAL INTERNAL AND BED BOUNDARY CONTACTS.

8168.7-69.4' F SORTED PARALLEL BEDDED VLT-GY CLY-CSS. CLY CEMENT. CARBONATE ONLY IN FX AND IN PORE FILLING IN CLASTS. CLY CLASTS TAN. LAM. 4. 2" X 1" NON-EROSIONAL BASE.

8169.4-69.7' VLT-GY F SORTED VF-CSS. TIGHT. CARBONATE CEMENT. 15° PLANAR TABULAR DIPS. EROSIONAL CONTACTS.

8169.7-69.85' F SORTED SR F-CSS. CONTORTED TO DESTROYED LOW ANGLE TROUGH X-BEDDING. F-MSS WITH CHLORITE (GLAUCONITE?) STRINGERS AND CLY CLASTS. DRAPES AND RIP-UP. NO CALCITE. MINOR MS ON BEDDING PLANES.

8169.85-69.9' AS ABOVE. F SORTED FSS. 40° ANGLE TROUGH X SETS. MS DRAPES.

8169.9-69.15' PARALLEL TO VERY-LOW ANGLE TROUGH X-BEDDED LT-MED GY F SORTED VF-MSS WITH CHLORITE. .05-0.2" TAN CLY CLASTS ON BEDDING PLANES.

8169.15-69.3' LT-GY F SORTED FSS WITH ABUNDANT CHLORITE. LOW ANGLE (15°) TROUGH X-BEDS. TAN CLY CLASTS ON BEDDING PLANES. EROSIONAL CONTACTS.

8169.85-70.8' LT-GY F-VFSS WITH ABUNDANT MS DRAPES. FLASER SS LAMINAE TO RIPPLE-LAMINATED. RIPPLE DIMENSIONS 0.1" BY 0.2". DK GY MS LAMINAE HAVE MINOR HORIZONTAL SS-FILLED BURROW(?) - PLANOLITES 0.1".

8170.8-8171.55' LT-GY FW SORTED SA FSS CARBONATE ONLY IN MOTTLED AREAS AND FX FILL. SS PLANAR BEDDED WITH 18° DIPS. MINOR CHLORITE. INDIVIDUAL BEDS FINE UPWARD. NON-EROSIONAL CONTACTS. TIGHT. MS CLASTS AT BASE.

8171.55-72.75' PART OF SECTION MISSING. F SORTED VF-FSS WITH MINOR CHLORITE AND CARBONATE. MINOR TO ABUN THIN MS DRAPES AND MS RIP-UP.

8172.8-72.55' LOW ANGLE (10°) TROUGH X-BEDDED FSS.

CORE MISSING — 8168-8169' 0.95'
8169.7-69.85' 0.15'
8171.5-8174' 1.3'
8174.8-77' 2.1'

CORE NUMBER A-22

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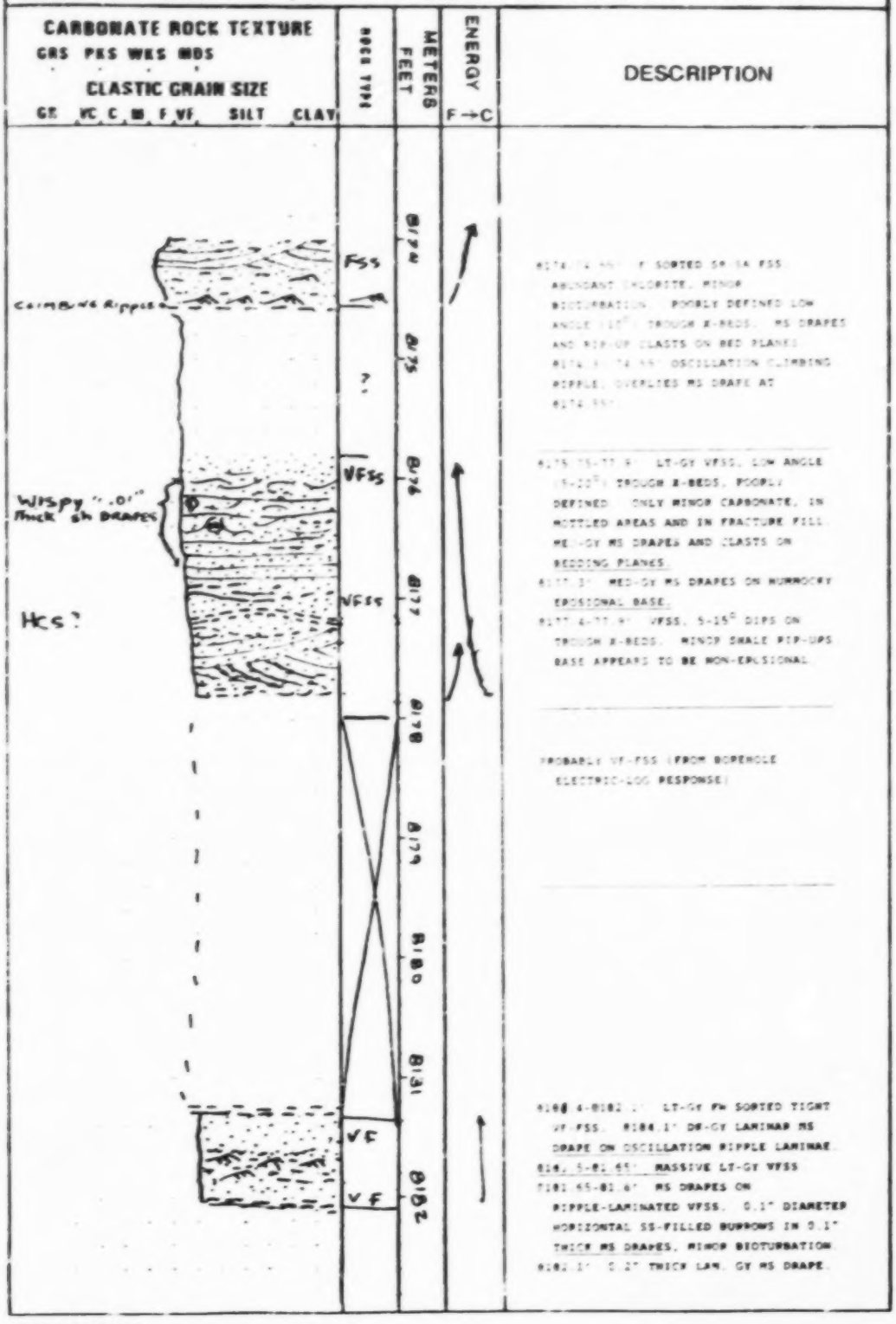
PAGE 5 OF 5

8174 TO 8182 FT

#1 MANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197.5' CORE DEPTHS



8174-74.4' F SORTED SR-SA FSS. ABUNDANT CALCITE. MINOR BIOTURBATION. POORLY DEFINED LOW ANGLE (10°) TROUGH X-BEDS. MS DRAPES AND RIP-UP CLASTS ON BED PLANES.
8174.4-74.55' OSCILLATION CLIMBING RIPPLE. OVERLIES MS DRAPE AT 8174.55'.

8174.55-77.9' LT-GY VFSS. LOW ANGLE (5-20°) TROUGH X-BEDS. POORLY DEFINED. ONLY MINOR CARBONATE, IN MOTTLED AREAS AND IN FRACTURE FILL. ME-GY MS DRAPES AND CLASTS ON BEDDING PLANES.
8177.3' MED-GY MS DRAPES ON HUMMOCKY EROSIONAL BASE.
8177.4-77.9' VFSS, 5-15° DIPS ON TROUGH X-BEDS. MINOR SMALE RIP-UPS. BASE APPEARS TO BE NON-ERUSIONAL.

PROBABLY VF-FSS (FROM BOREHOLE ELECTRIC-LOG RESPONSE)

8180.4-8182.1' LT-GY FW SORTED TIGHT VF FSS. 8184.1' DK-GY LAMINAR MS DRAPE ON OSCILLATION RIPPLE LAMINAE.
8181.5-81.65' MASSIVE LT-GY VFSS.
8181.65-81.6' MS DRAPES ON RIPPLE-LAMINATED VFSS. 0.1" DIAMETER HORIZONTAL SS-FILLED BURROWS IN 0.1" THICK MS DRAPES. MINOR BIOTURBATION.
8182.1' 0.2" THICK LAM. GY MS DRAPE.

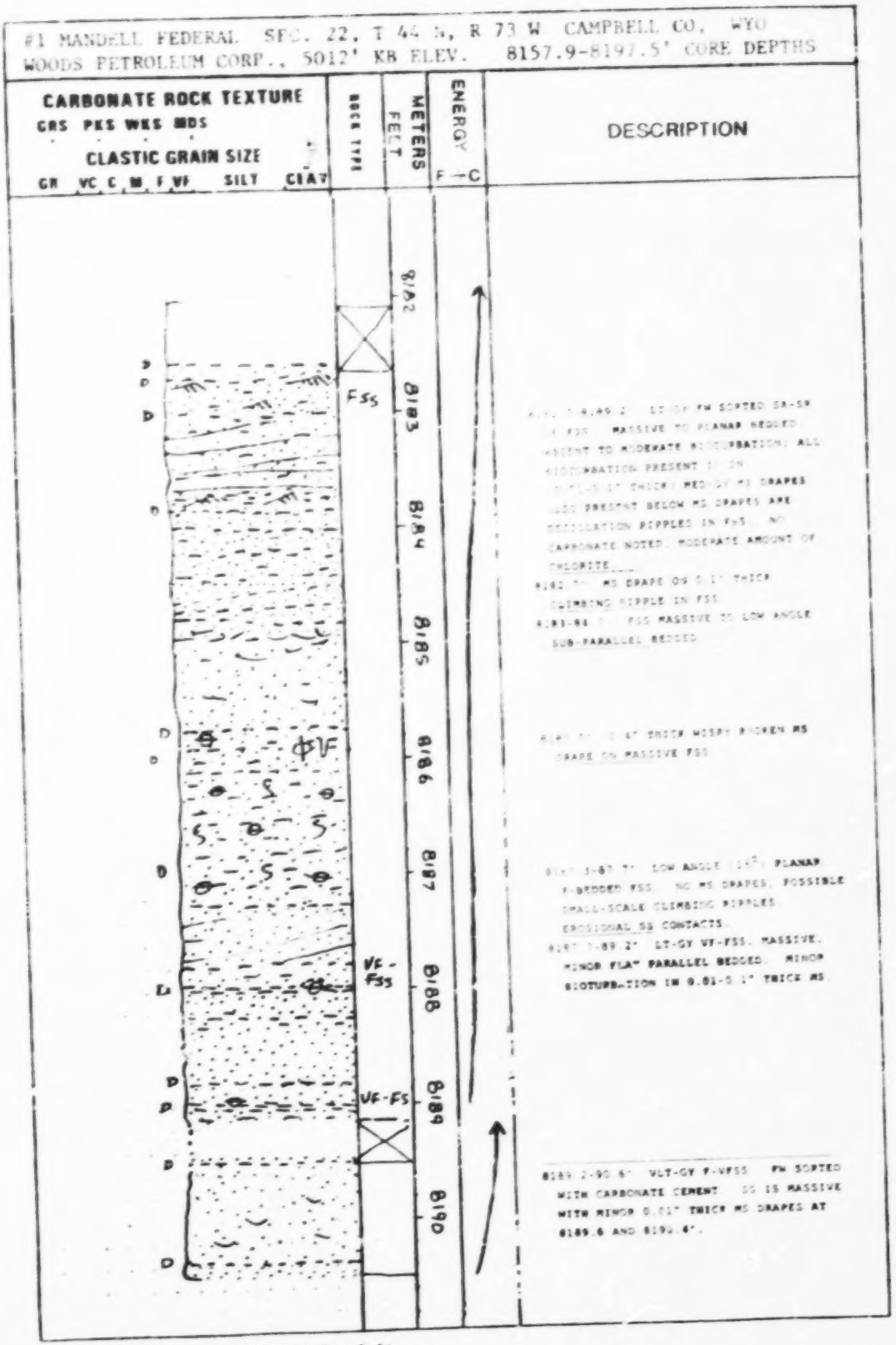
CORE MISSING — 8174-77' 1.1'
8178-81.4' 3.4'
8182-82.75' 0.55'

CORE NUMBER A-22

PAGE 1 OF 5

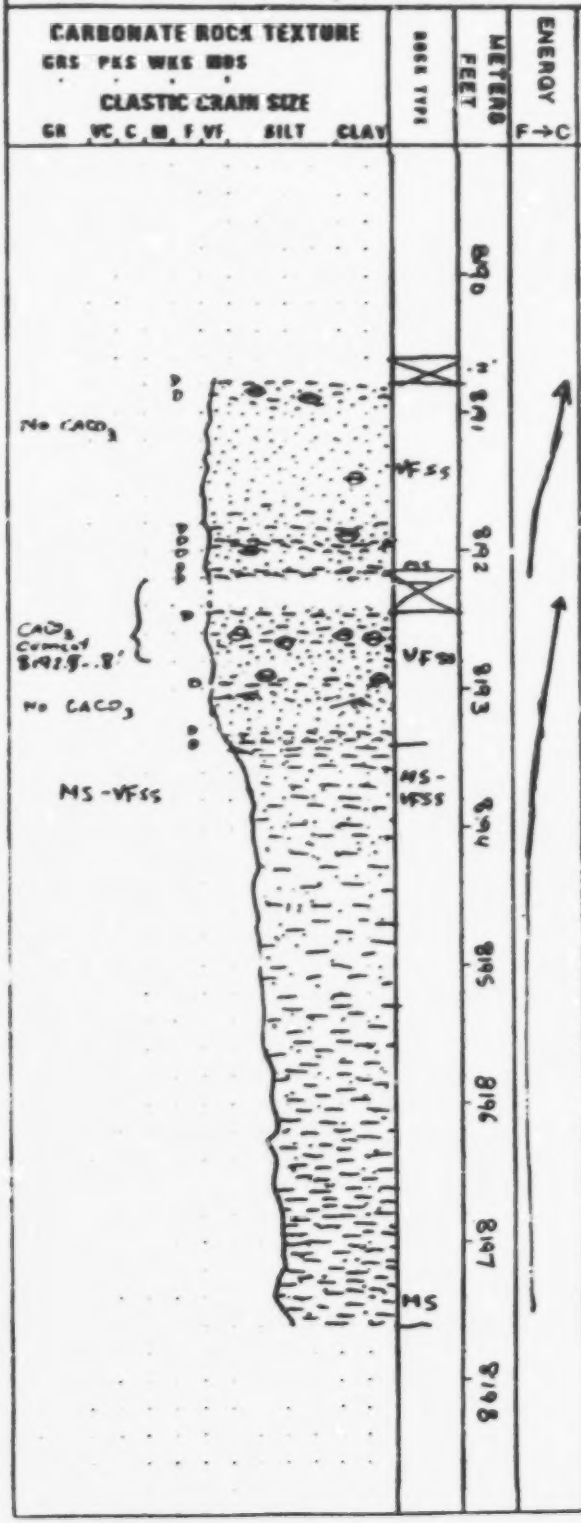
8157 TO 8197 FT

#1 MANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197.5' CORE DEPTHS



CORE MISSING — 8182.1-82.7' 0.6'
8183.2-83.9' 0.2'
8184.5-84.8' 0.2'
8186.4-87.0' 0.2'
8189-90' 0.45'
8190.1-90.8' 0.3'

#1 HANDELL FEDERAL SEC. 22, T 44 N, R 73 W CAMPBELL CO, WYO
WOODS PETROLEUM CORP., 5012' KB ELEV. 8157.9-8197.5' CORE DEPTHS



DESCRIPTION

8190.6-8192.5' LT-GY SA FW SORTED VFSS. MASSIVE TO SUB-PARALLEL BEDDED. MOD AMOUNT OF CHLORITE. RED-GY MS DRAPES (0.01-0.2"); WITH MINOR HORIZONTAL BURROWS (PLANOLITES) 0.02-0.05" DIAMETER.
8191.5-91.9' MS DRAPES OVER HUMMOCKY RIPPLE-LAMINATED SS.

8192.5-93.4' FW SORTED VLT-GY VFSS. MASSIVE TO SUB-PARALLEL BEDDED. 8192.5-92.8' CARBONATE CEMENT. HORIZONTAL BURROWS. OSCILLATION RIPPLES 8193'.

8193.4-97.6' RED-GY MS-VFSS. ENERGY DECREASES DOWNWARD WITH GRADUAL DOWNWARD INCREASE IN MS CONTENT AND BIOTURBATION.
LT-GY VFSS IS MOSTLY LAMINAR WITH 0.05"-0.8" THICK DK-GY MS DRAPES. HORIZONTAL SS-FILLED MAINLY PLANOLITES BURROWS ARE 0.05-0.4" DIAMETER. SS BIOTURBATION IS MINOR TO MODERATE.
8194.1-94.15' TAN CLY CEMENT IN VFSS

8196.2-96.3' TAN CLY CEMENT IN VFSS

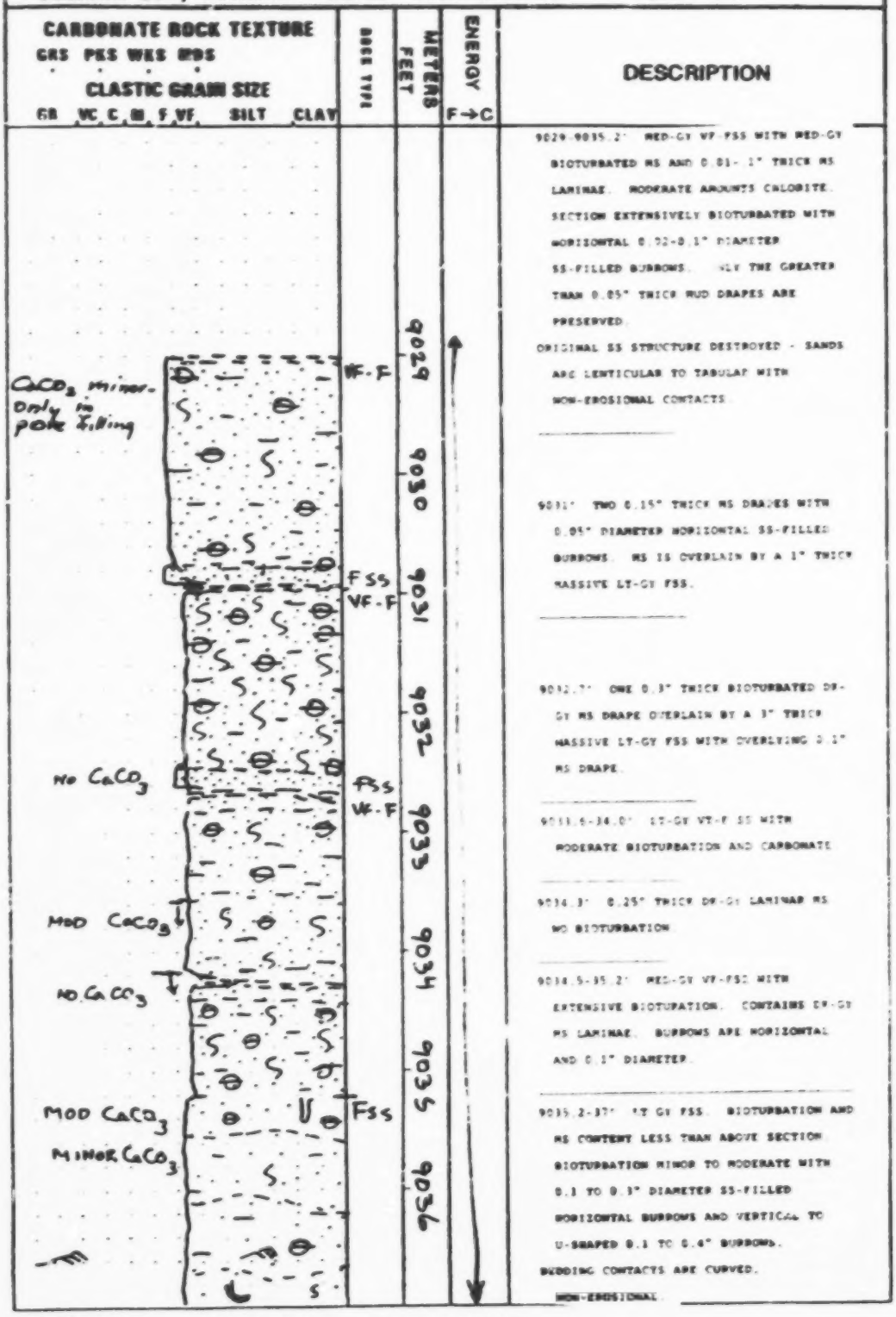
8196.3-95.2' OSCILLATION RIPPLE LAMINAE. UP TO 0.3" X 1.9".

CORE MISSING — 8192.2-92.5' 0.3'

CORE NUMBER A 738

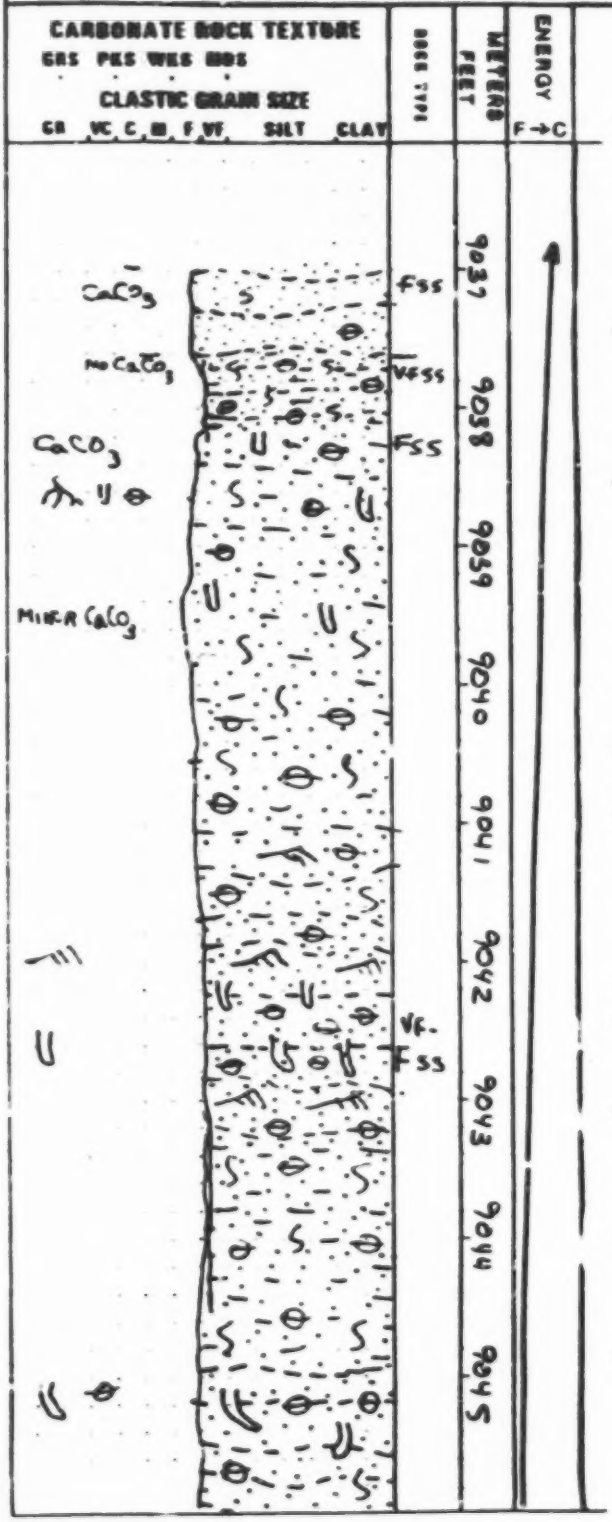
9029 TO 9057 FT

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB


CARBONATE ROCK TEXTURE
GRS PKS WKS MDS
CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY
ROCK TYPE
METERS
FEET
ENERGY
F→C
DESCRIPTION
CaCO3 minor. Only in pore filling
No CaCO3
MOD CaCO3
NO CaCO3
MOD CaCO3
MINOR CaCO3
VF-F
FSS
VF-F
FSS
VF-F
FSS
9029
9030
9031
9032
9033
9034
9035
9036
9029-9035.2' MED-GY VF-FSS WITH MED-GY BIOTURBATED MS AND 0.01-.1" THICK MS LAMINAE. MODERATE AMOUNTS CALCITE. SECTION EXTENSIVELY BIOTURBATED WITH HORIZONTAL 0.02-0.1" DIAMETER SS-FILLED BURROWS. ALL THE GREATER THAN 0.05" THICK MUD DRAPES ARE PRESERVED.
ORIGINAL SS STRUCTURE DESTROYED - SANDS ARE LENTICULAR TO TABULAR WITH NON-EROSIONAL CONTACTS.
9031' TWO 0.15" THICK MS DRAPES WITH 0.05" DIAMETER HORIZONTAL SS-FILLED BURROWS. MS IS OVERLAIN BY A 1" THICK MASSIVE LT-GY FSS.
9032.7' ONE 0.3" THICK BIOTURBATED DK-GY MS DRAPE OVERLAIN BY A 3" THICK MASSIVE LT-GY FSS WITH OVERLYING 0.1" MS DRAPE.
9033.6-34.0' LT-GY VF-F SS WITH MODERATE BIOTURBATION AND CARBONATE
9034.3' 0.25" THICK DK-GY LAMINAR MS NO BIOTURBATION
9034.5-35.2' MED-GY VF-FSS WITH EXTENSIVE BIOTUPATION. CONTAINS DK-GY MS LAMINAE. BURROWS ARE HORIZONTAL AND 0.1" DIAMETER.
9035.2-37' LT GY FSS. BIOTURBATION AND MS CONTENT LESS THAN ABOVE SECTION. BIOTURBATION MINOR TO MODERATE WITH 0.1 TO 0.3" DIAMETER SS-FILLED HORIZONTAL BURROWS AND VERTICAL TO U-SHAPED 0.1 TO 0.4" BURROWS.
BEDDING CONTACTS ARE CURVED. NON-EROSIONAL

CORE MISSING -- 9034.2-9036.9' 0.5' CORE MISSING

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB



CORE MISSING —

DESCRIPTION

9037-9037.9' CARBONATE CEMENTED FW SORTED VF-FSS. MINOR SS FILLED 0.05" DIAMETER HORIZONTAL BURROWS AND 0.02-0.05" THICK LAMINAR MS DRAPES. SS-MS CONTACTS ARE CURVED AND SLIGHTLY EROSIONAL. NO INTERNAL SS BEDDING SEEN. LOWER SS CONTACT GRADATIONAL.

9037.9-38.1' EXTENSIVELY BIOTURBATED VF-FSS. RED-GY MS DRAPES. BURROWS ARE SS-FILLED, HORIZONTAL, 0.02-0.2" IN DIAMETER AND TEICHICHNUS BACKFILL. BURROWS ARE 0.2-0.35" DIAMETER.

9038.1-41.05' FW SORTED LT-GY F SS. MOD CHONDRITES BIOTURBATION RESULTS IN MOTTLED APPEARANCE. 0.02-0.05" THICK RED-GY MS LAMINAE HAVE 0.05" DIA. SS-FILLED BURROWS. VF-FSS IS CARBONATE CEMENTED WITH 0.02" HORIZONTAL AND 0.02" X 0.4" VERTICAL TO SUB-VERTICAL BURROWS. VERTICAL BURROWS DON'T CUT MS LAMINAE.

9040.5-9041.05' ABUNDANT CHONDRITES 0.1" DIAMETER BURROWS.

9041.05-9044' RED TO LT-GY VF-F SS. MS CONTENT INCREASES DOWNWARD. MODERATE BIOTURBATION. WHERE PRESENT SS IS TABULAR TO RIPPLE LAMINATED. CONTACTS WITH RED-GY MS DRAPES ARE CURVED, NON-EROSIONAL. RAPID CHANGES IN BURROW CHARACTER ARE DETAILED BELOW.

9041.2-42.3' PRESERVED RIPPLE LAMINAE WITH MS DRAPES IN HORIZONTALLY BURROWED FACIES.

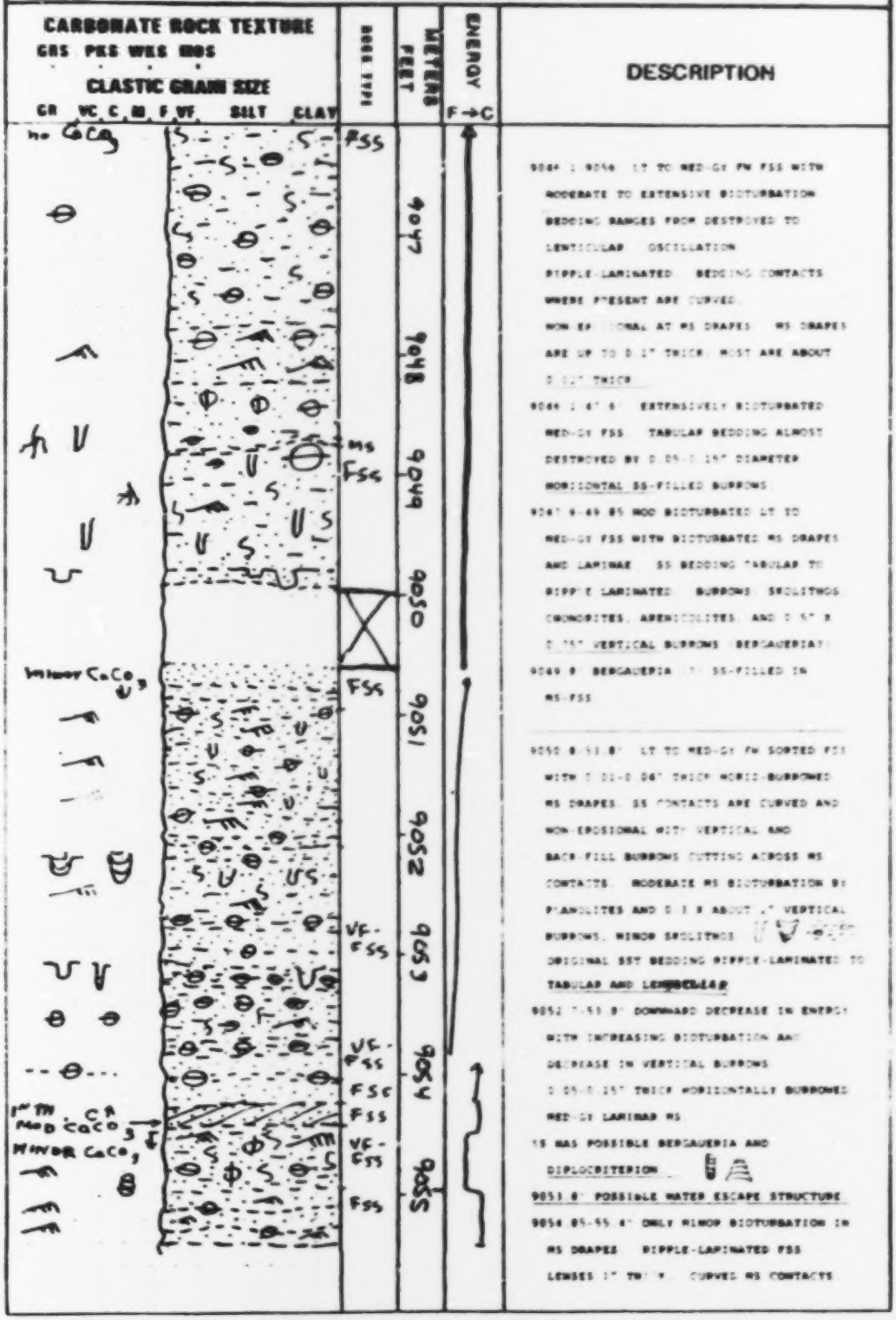
9041.55-42.75' SKOLITHOS AND POSSIBLY ARENICOLITES- VERTICAL BURROWS 0.2" X 1.9" CROSS-CUT MS DRAPES. EXTENSIVE 0.2-0.3" DIAMETER HORIZONTAL BURROWS.

9043.2-43.5' RIPPLE LAMINATED FW SORTED FSS. MODERATE HORIZONTAL BURROWING AND BIOTURBATION. CURVED NON-EROSIONAL CONTACTS WITH MS.

9043.5-ABOUT 9045' EXTENSIVELY BIOTURBATED RED-GY VF-FSS. MS CONTENT INCREASES DOWNWARD. BEDDING TABULAR WHERE NOT DESTROYED. 0.02-0.05" DIAMETER HORIZONTAL BURROWS ARE FILLED WITH LT AND RED-GY VFSS.

9045-9046.1' MODERATELY BIOTURBATED VF-FSS CONTAINING PLANOLITES AND ARENICOLITES. SS-MS CONTACTS ARE CURVED.

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB



9046 - 9056 LT TO MED-GY FW FSS WITH MODERATE TO EXTENSIVE BIOTURBATION BEDDING RANGES FROM DESTROYED TO LENTICULAR OSCILLATION RIPPLE-LAMINATED BEDDING CONTACTS WHERE PRESENT ARE CURVED NON EROSIONAL AT MS DRAPES MS DRAPES ARE UP TO 0.1" THICK MOST ARE ABOUT 0.01" THICK

9046.2-46.8' EXTENSIVELY BIOTURBATED MED-GY FSS TABULAR BEDDING ALMOST DESTROYED BY 0.05-0.15" DIAMETER HORIZONTAL SS-FILLED BURROWS

9047.6-49.85 MOD BIOTURBATED LT TO MED-GY FSS WITH BIOTURBATED MS DRAPES AND LAMINAE SS BEDDING TABULAR TO RIPPLE LAMINATED BURROWS SKOLITHOS CHONDRITES, ARENICOLITES, AND 0.5" TO 0.75" VERTICAL BURROWS (BERGAUERIA?)

9049.8' BERGAUERIA ? SS-FILLED IN MS-FSS

9050.8-53.8' LT TO MED-GY FW SORTED FSS WITH 0.01-0.04" THICK HORIZ-BURROWED MS DRAPES. SS CONTACTS ARE CURVED AND NON-EROSIONAL WITH VERTICAL AND BACK-FILL BURROWS CUTTING ACROSS MS CONTACTS. MODERATE MS BIOTURBATION BY PLANOLITES AND 0.1 TO ABOUT .3" VERTICAL BURROWS. MINOR SKOLITHOS ORIGINAL SST BEDDING RIPPLE-LAMINATED TO TABULAR AND LENTICULAR

9052.7-53.8' DOWNWARD DECREASE IN ENERGY WITH INCREASING BIOTURBATION AND DECREASE IN VERTICAL BURROWS 0.05-0.15" THICK HORIZONTALLY BURROWED MED-GY LAMINAR MS

IS WAS POSSIBLE BERGAUERIA AND DIPLOCRITERION

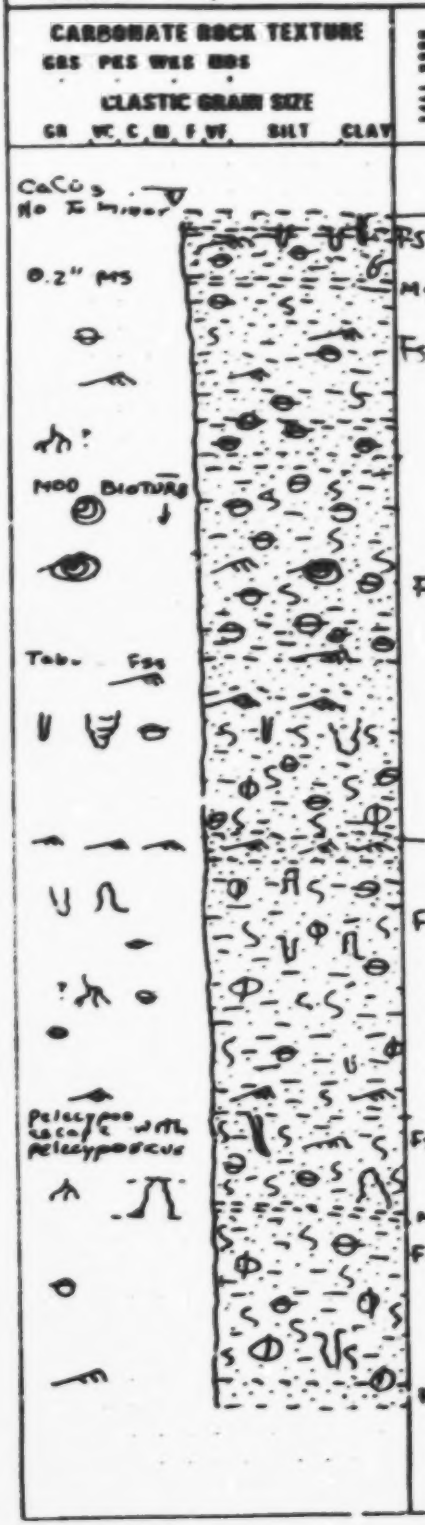
9053.8' POSSIBLE WATER ESCAPE STRUCTURE

9054.85-55.4' ONLY MINOR BIOTURBATION IN MS DRAPES RIPPLE-LAMINATED FSS LENSES 1" THICK CURVED MS CONTACTS

CORE MISSING -- 9049.2-50.8' 0.95' CORE MISSING - PROBABLY FROM 9049.85-50.8'.

9054 TO 9062 FT

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB



DESCRIPTION

9054 4-92 1' SAME AS ABOVE FSS BUT MS CONTENT AND BIOTURBATION INCREASE DOWNWARD. MS DRAPES BECOME THINNER, MORE NUMEROUS, AND WITH INCREASED, POSSIBLY PLANOLITES. BIOTURBATION BIOTURBATED ZONES ALTERNATE WITH 0.5 TO 2" THICK TABULAR-MASSIVE TO RIPPLE LAMINATED FSS WITH MINOR TO MODERATE VERTICAL BURROWS AND CHONDRITES

9054 4' SPHEROLITHS

9054 7' DIPLOCRITERION [illegible] 0.25" DIA

9056 0' DIPLOCRITERION

9058' EST. HORIZONTAL BACKFILL BURROWS 0.4" DIAMETER - TEICHICHNUS

9058 0-59.15' TABULAR MASSIVE LT-GY FSS - FINES UPWARD SLIGHTLY. UPPER MS CONTACT IS RIPPLE LAMINATED

9059 2[illegible] 2.1 X 0.3" OSCILLATION RIPPLE

9059 3-40 2' SPHEROLITHS, BURROWED, PELECYPOD ESCAPE 0.4 X 2.2" IN EXTENSIVELY BIOTURBATED MS-FSS

9061 1-40.25' RIPPLE LAMINATED FSS WITH MS DRAPES. ESTIMATED 0.4 X 2" RIPPLES

9061 25-62 2' MODERATE TO EXTENSIVE BIOTURBATION WITH CHONDRITES AND PELECYPOD ESCAPE IN MED-GY VF-FSS WITH MS - BROWN MS LAMINAE IN PLACES GIVE CORE A WISPY APPEARANCE

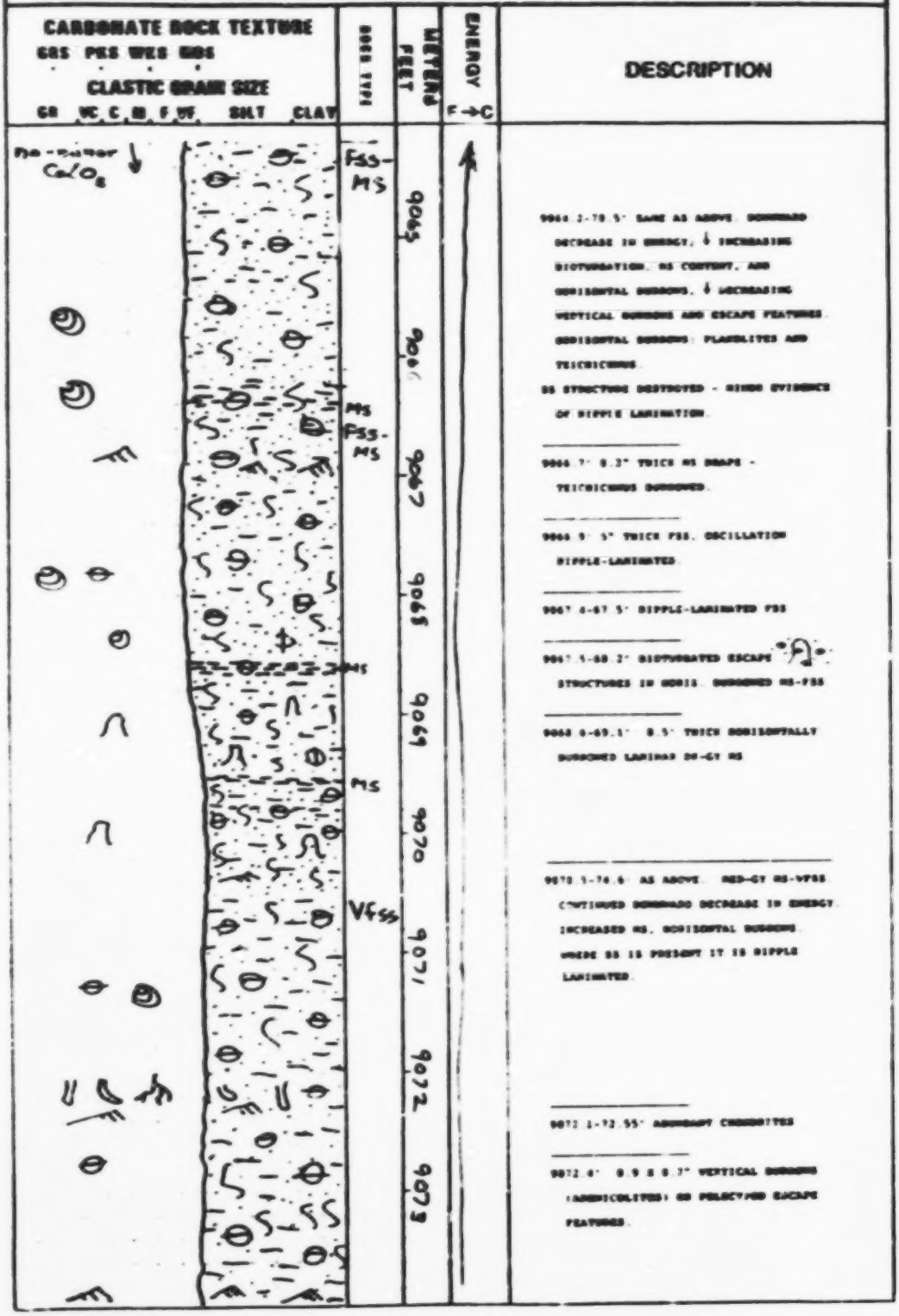
9062 1-48 2' EXTENSIVELY BIOTURBATED MED-GY FSS CHONDRITES, PELECYPOD ESCAPE BURROW [illegible] MINOR SPHEROLITHS

WHERE SS STRUCTURE IS PRESENT - IT IS RIPPLE LAMINATED IN ABOUT 0.1-0.6" THICK LENSES

CORE MISSING — ABOUT 2-4" OF CORE MISSING FROM BETWEEN MOST FOOTAGE INTERVALS.

9064.2 TO 9074 FT

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB


CARBONATE ROCK TEXTURE
GRS PKS WKS MDS
CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY
ROCK TYPE
METERS FEET
ENERGY F→C
DESCRIPTION
Fss-MS
MS
Fss-MS
MS
MS
Vfss
9065
9066
9067
9068
9069
9070
9071
9072
9073
9064 2-70.5' SAME AS ABOVE. DOWNWARD DECREASE IN ENERGY, ↓ INCREASING BIOTURBATION, MS CONTENT, AND HORIZONTAL BURROWS, ↓ DECREASING VERTICAL BURROWS AND ESCAPE FEATURES. HORIZONTAL BURROWS: PLANOLITES AND TEICHICHNUS.
SS STRUCTURE DESTROYED - MINOR EVIDENCE OF RIPPLE LAMINATION.
9066 7' 0.3' THICK MS SHAPE - TEICHICHNUS BURROWED.
9066 9' 5" THICK FSS, OSCILLATION RIPPLE-LAMINATED
9067 4-67 5' RIPPLE-LAMINATED FSS
9067 5-68.2' BIOTURBATED ESCAPE STRUCTURES IN MDSTS BURROWED MS-FSS
9068 0-69.1' 0.5' THICK HORIZONTALLY BURROWED LAMINAE DK-GY MS
9070 1-70.6' AS ABOVE. RED-GY MS-VFSS CONTINUED DOWNWARD DECREASE IN ENERGY INCREASED MS, HORIZONTAL BURROWS. WHERE SS IS PRESENT IT IS RIPPLE LAMINATED.
9072 1-72.55' ABUNDANT CHONDRITES
9072.6' 0.9 & 0.7' VERTICAL BURROWS (ARENICOLITES) OR POLYCYCAD ESCAPE FEATURES.

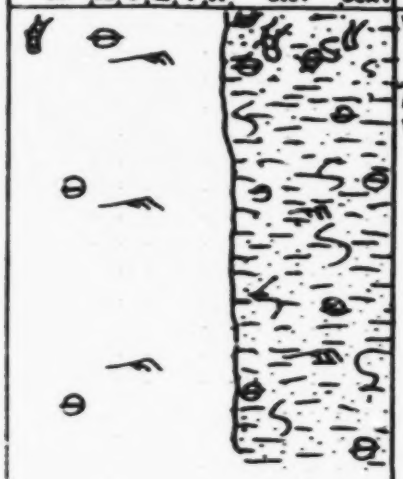
CORE MISSING --

1-6" OF CORE MISSING FROM DEPOSED PLOT PHOTOGRAPH

CORE NUMBER A 738

9074 TO 9077 FT

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB



DESCRIPTION

9074 2-76 4" B R I 4" BACKFILL BURROW OR ESCAPE MS AND FSS FILLED

9074 6-9077 2' DK-GY MS-VFSS ENERGY INCREASES DOWNWARD MINOR TO MODERATE PLANOLITES BIOTURBATION, NO VERTICAL BURROWS
LAMINATED MS AND VFSS MINOR RIPPLE LAMINATION IN SS GRADATIONAL CONTACTS WITH UNDERLYING MS

CORE MISSING --

CORE NUMBER A 738

9077.2 TO 9089 FT

#1 RED UNIT S. 26, T 48 N, R 79 W, WOODS PETROLEUM CO.
JOHNSON CO., WYOMING DEPTH 9029-9089 ft. 4,525 KB

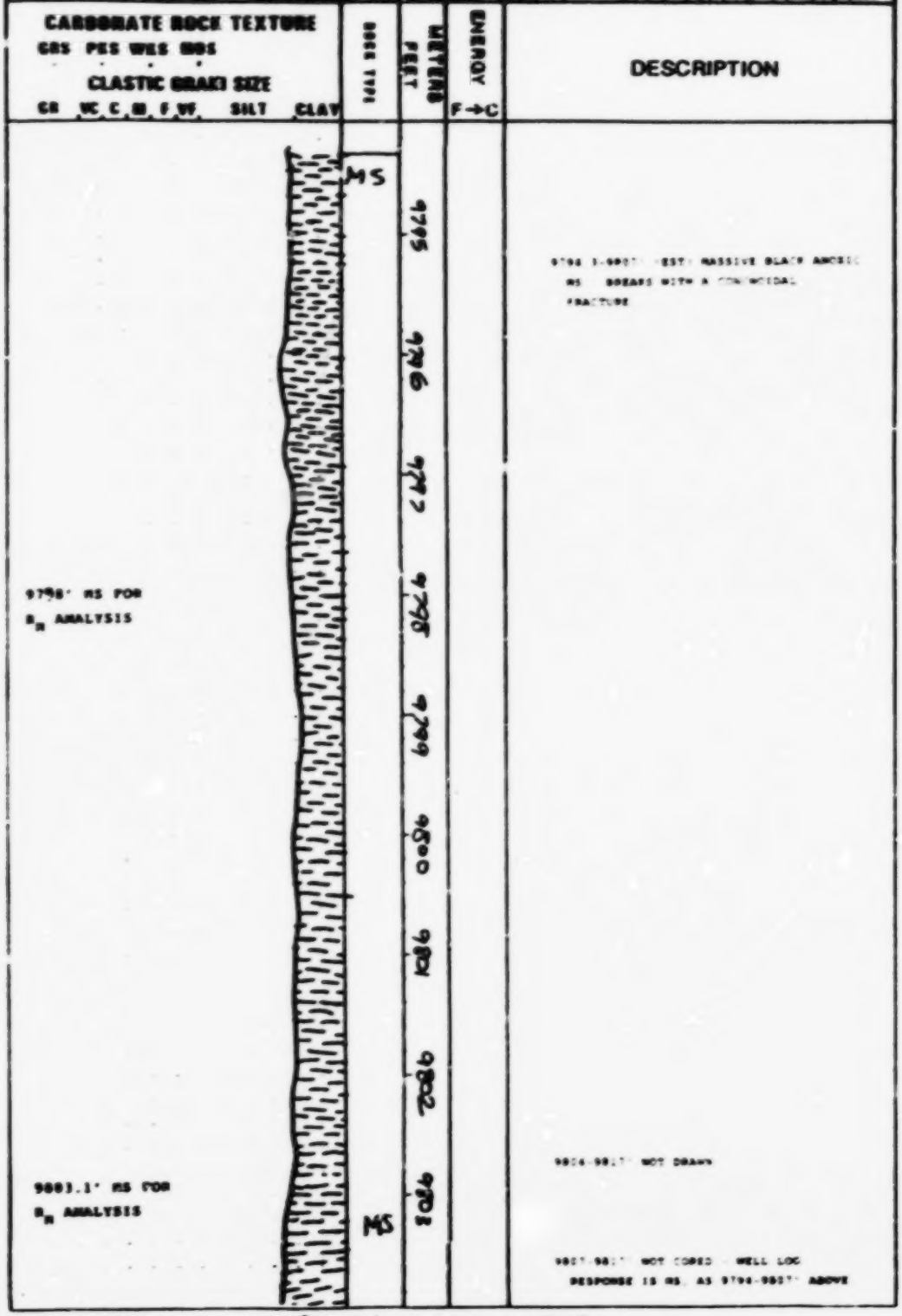
CARBONATE ROCK TEXTURE / CLASTIC GRAIN SIZE (GR VC C M F VF SILT CLAY)	FEET	MEMBER	ENERGY F→C	DESCRIPTION
NO $CaCO_3$ ↓	9078	MS		9077 2-09' DK-GY MS-SLTST EXTENSIVELY BIOTURBATED WITH 0.05" AND SMALLER HORIZONTAL BURROWS
ABUNDANT $CaCO_3$ ↓	9076	MS		9078 8-79 6' MASSIVE MED-GY CLYST-MS WITH ABUNDANT CARBONATE CEMENT MOTTLED WITH NO VISIBLE INTERNAL STRUCTURE (POSSIBLE DIAGENETIC EFFECT) CONTACTS WITH UNDERLYING MS SHARP, IRREGULAR
NO $CaCO_3$ ↓	9074	MS		9079 6-85 0 AS ABOVE BIOTURBATED MS SLTST
	9068			
	9062			
	9054			
	9048			9081 8-86 2' MASSIVE MED-GY CLYST-MS WITH ABUNDANT CARBONATE CEMENT NO INTERNAL STRUCTURE CONTACTS WITH BOUNDING MS SHARP, IRREGULAR
$CaCO_3$ ↓	9046	MS		
NO $CaCO_3$	9046→9029	MS		9086 2-09' AS BIOTURBATED MS-SLTST ABOVE

CORE MISSING --

CORE NUMBER C 302 22 PAGE 1 OF 1

9794 TO 9807 FT

15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORP., 9794-9877.1 ft depths

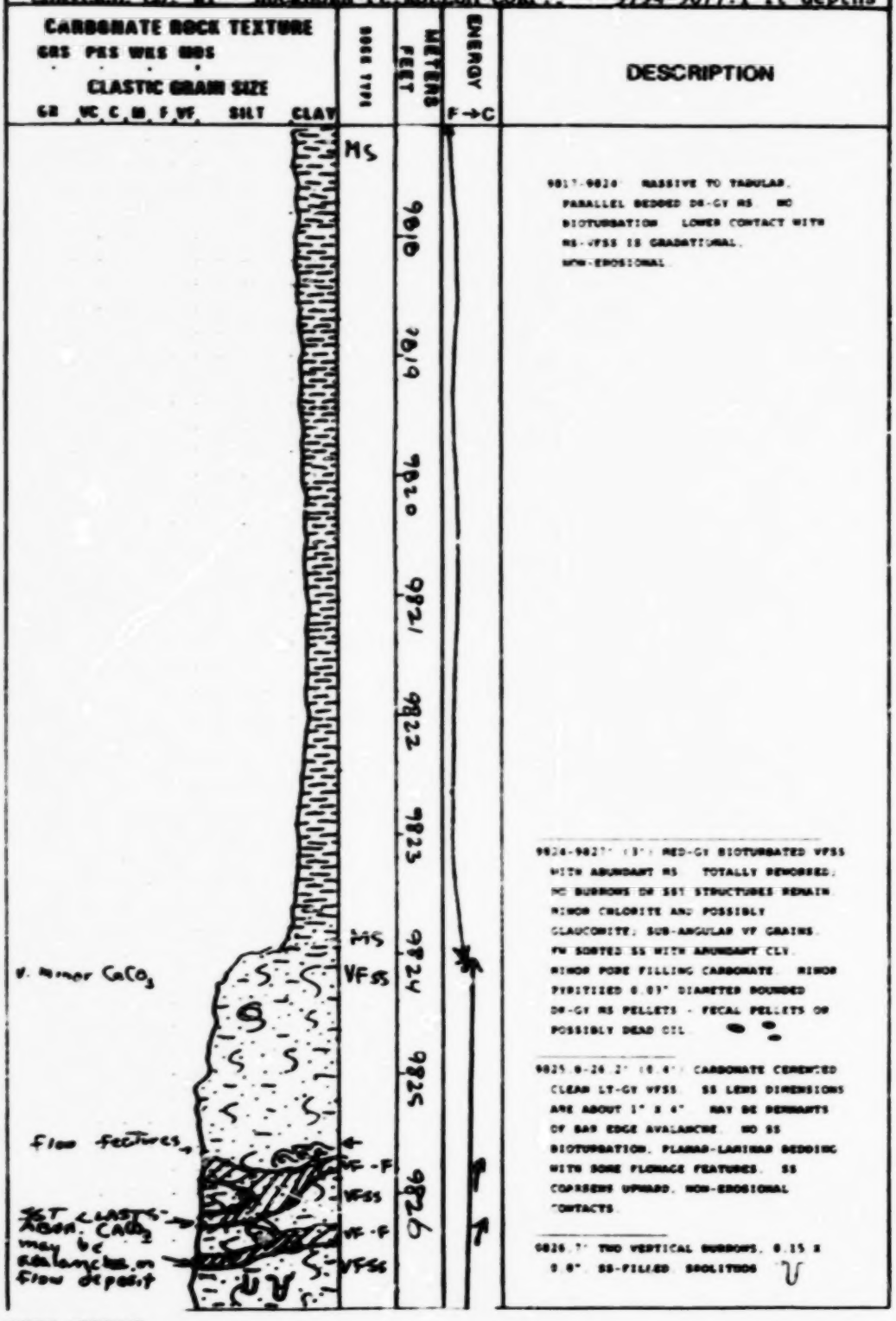


CORE MISSING – 9807 - 9817 NOT CORED

CORE NUMBER C 302 23 PAGE 2 OF 2

9817 TO 9827 FT

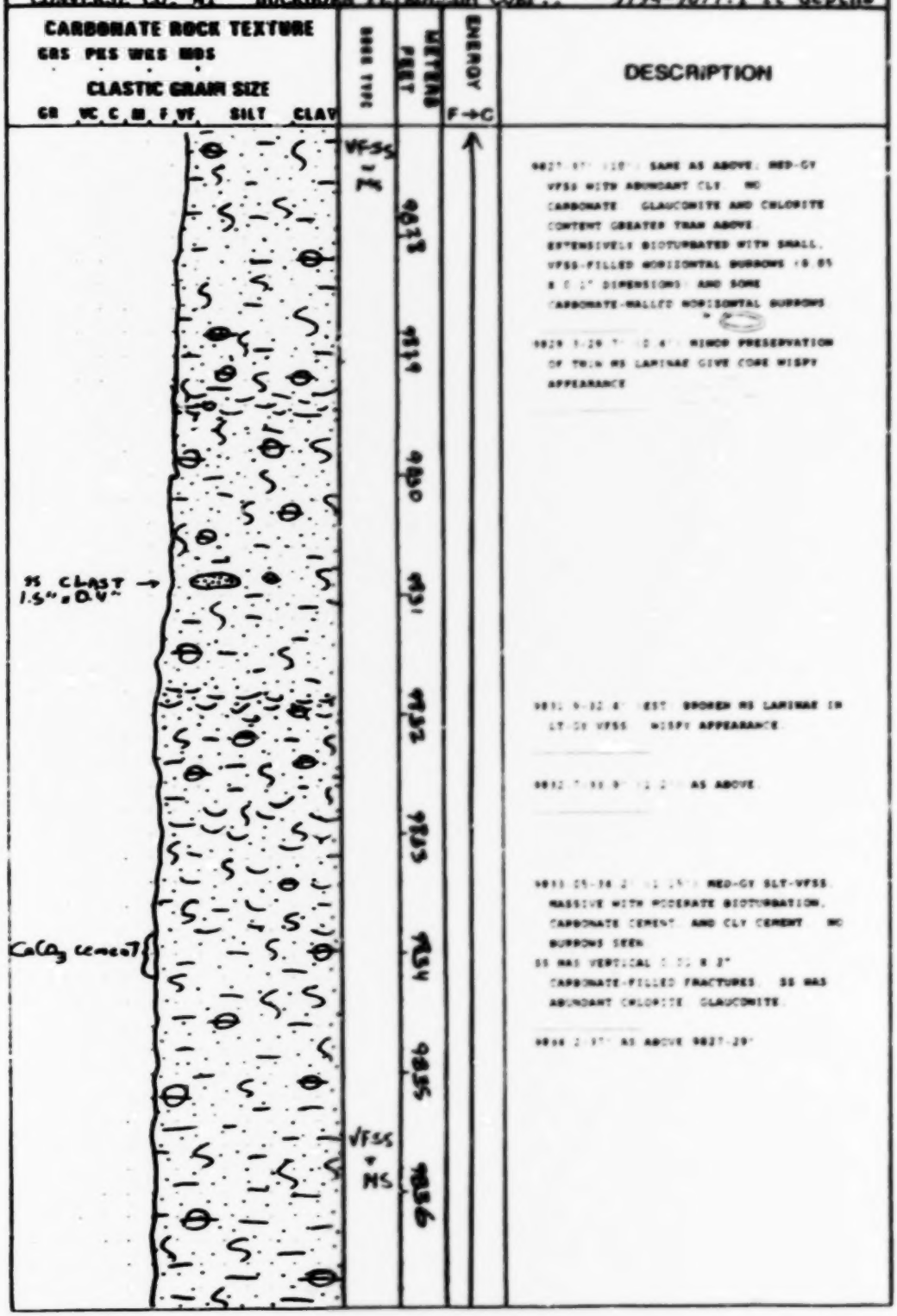
15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORP.. 9794-9877.1 ft depths


CARBONATE ROCK TEXTURE
GRS PKS WKS MDS
CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY
FEET
METERS
ENERGY
F→C
DESCRIPTION
MS
9196
9186
9196
9186
9186
9186
MS
VFSS
9186
9186
9186
V. minor CaCO3
9825.5' CORE PLUG FOR CLAY
Flow features
VF-F
VFSS
VF-F
VFSS
9186
SLT LAMS. Abun. CaCO3 may be avalanche or flow deposit
CORE MISSING --
9826-26.9' 9" CORE MISSING
9817-9826' MASSIVE TO TABULAR, PARALLEL BEDDED DK-GY MS. NO BIOTURBATION. LOWER CONTACT WITH MS-VFSS IS GRADATIONAL, NON-EROSIONAL.
9826-9827' (1') RED-GY BIOTURBATED VFSS WITH ABUNDANT MS. TOTALLY REWORKED, NO BURROWS OR SST STRUCTURES REMAIN. MINOR CHLORITE AND POSSIBLY GLAUCONITE, SUB-ANGULAR VF GRAINS. VW SORTED SS WITH ABUNDANT CLY. MINOR PORE FILLING CARBONATE. MINOR PYRITIZED 0.03" DIAMETER ROUNDED DK-GY MS PELLETS - FECAL PELLETS OR POSSIBLY DEAD OIL.
9825.8-26.2' (0.4') CARBONATE CEMENTED CLEAN LT-GY VFSS. SS LENS DIMENSIONS ARE ABOUT 1" X 4". MAY BE REMNANTS OF BAR EDGE AVALANCHE. NO SS BIOTURBATION. PLANAR-LAMINAR BEDDING WITH SOME FLOWAGE FEATURES. SS COARSENS UPWARD. NON-EROSIONAL CONTACTS.
9826.7' TWO VERTICAL BURROWS, 0.15 X 0.6". SS-FILLED. SPOLITHOS

CORE NUMBER C 302

9827 TO 9837 FT

15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORP. 9794-9877.1 ft depths



9827-97' (10') SAME AS ABOVE. MED-GY VFSS WITH ABUNDANT CLY MX CARBONATE GLAUCONITE AND CHLORITE CONTENT GREATER THAN ABOVE. EXTENSIVELY BIOTURBATED WITH SMALL, VFSS-FILLED HORIZONTAL BURROWS (0.05 X 0.2" DIMENSIONS) AND SOME CARBONATE-WALLED HORIZONTAL BURROWS.

9829 1-29 7' (0.4') MINOR PRESERVATION OF THIN MS LAMINAE GIVE CORE WISPY APPEARANCE

9831 9-32.4' (EST) BROKEN MS LAMINAE IN LT-GY VFSS WISPY APPEARANCE.

9832 7 33 9' (1.2') AS ABOVE.

9833 29-34.2' (1.2') MED-GY SLT-VFSS MASSIVE WITH MODERATE BIOTURBATION. CARBONATE CEMENT AND CLY CEMENT MX BURROWS SEEN.
SS HAS VERTICAL (?) 0.2" CARBONATE-FILLED FRACTURES. SS HAS ABUNDANT CHLORITE GLAUCONITE.

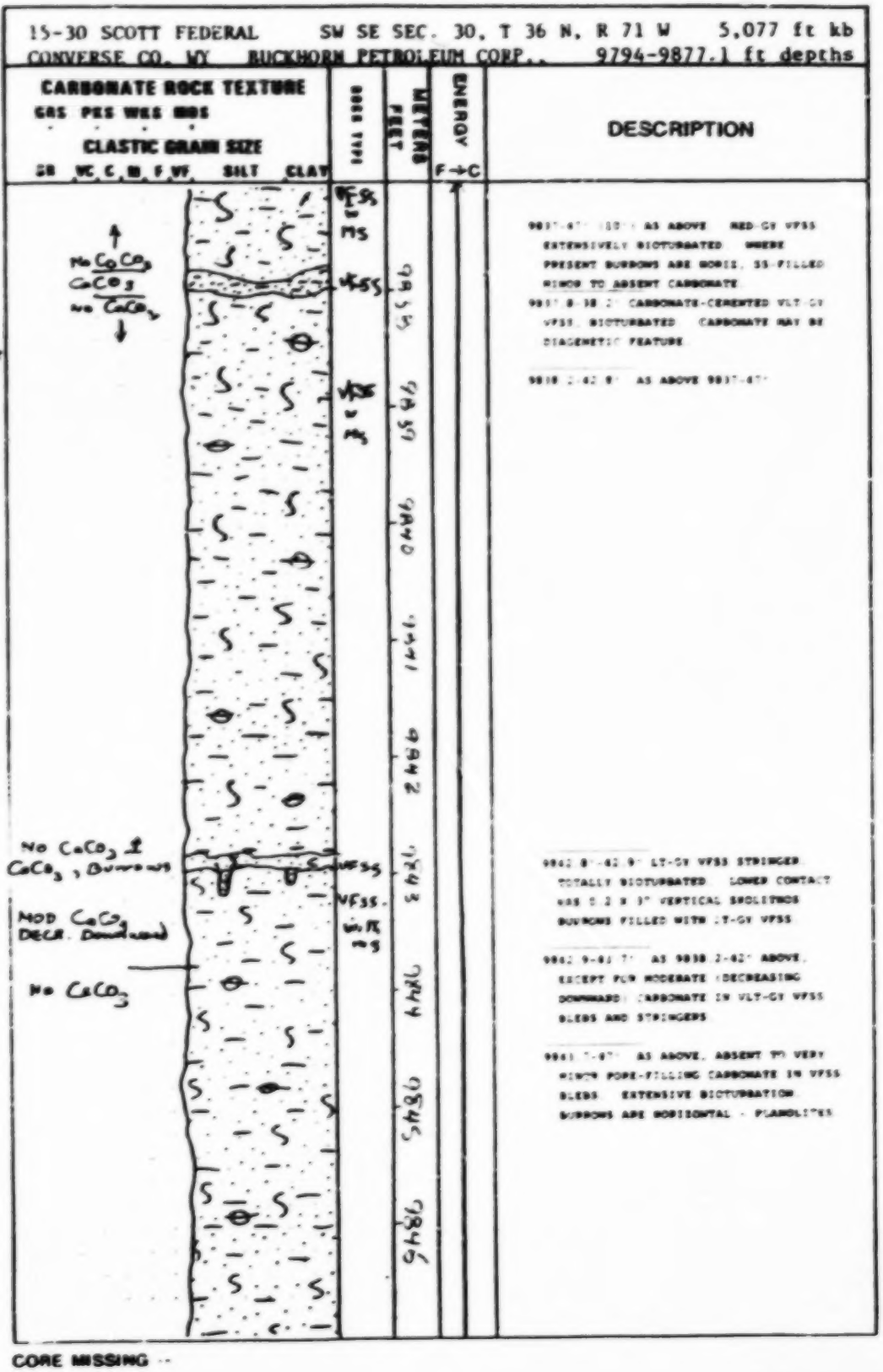
9836 2 37' AS ABOVE 9827-29'

CORE MISSING

CORE NUMBER C 302 23 PAGE 4 OF 7

9837 TO 9847 FT

15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORP., 9794-9877.1 ft depths

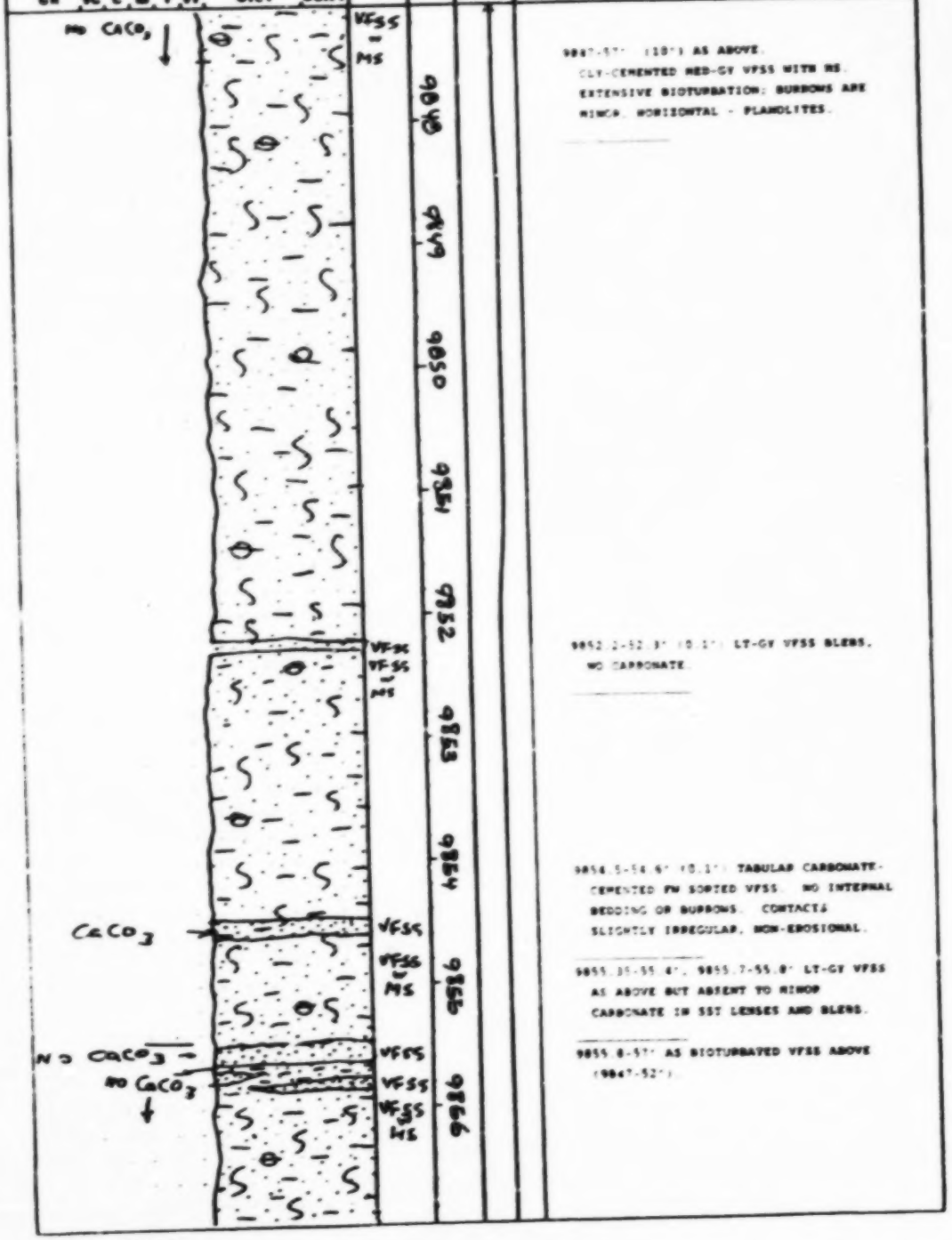

CARBONATE ROCK TEXTURE
GRS PKS WKS MDS
CLASTIC GRAIN SIZE
GR VC C M F VF SILT CLAY
ROCK TYPE
METERS FEET
ENERGY
F→C
DESCRIPTION
9838.2' PLUG FOR CLAY. BRNISH BIOT VFSS WITH RS, NO CARBONATE
No CaCO3
CaCO3
No CaCO3
No CaCO3 ↓ CaCO3, Burrows
MOD CaCO3 DECR. Downward
No CaCO3
MS
VFSS
VFSS with MS
9837-47' (10') AS ABOVE. RED-GY VFSS EXTENSIVELY BIOTURBATED. WHERE PRESENT BURROWS ARE ROBIN, SS-FILLED MINOR TO ABSENT CARBONATE
9838.2-42.9' CARBONATE-CEMENTED VLT-GY VFSS. BIOTURBATED. CARBONATE MAY BE DIAGENETIC FEATURE
9838.2-42.9' AS ABOVE 9837-47'
9842.9-43.9' LT-GY VFSS STRINGER TOTALLY BIOTURBATED. LOWER CONTACT HAS 0.2 X 3" VERTICAL BURROWS BURROWS FILLED WITH LT-GY VFSS
9842.9-43.7' AS 9838.2-42' ABOVE, EXCEPT FOR MODERATE (DECREASING DOWNWARD) CARBONATE IN VLT-GY VFSS BLEBS AND STRINGERS
9843.7-47' AS ABOVE, ABSENT TO VERY MINOR PORE-FILLING CARBONATE IN VFSS BLEBS. EXTENSIVE BIOTURBATION. BURROWS ARE HORIZONTAL - PLANOLITES

CORE MISSING --

CORE NUMBER C 302

9347 TO 9351 FT

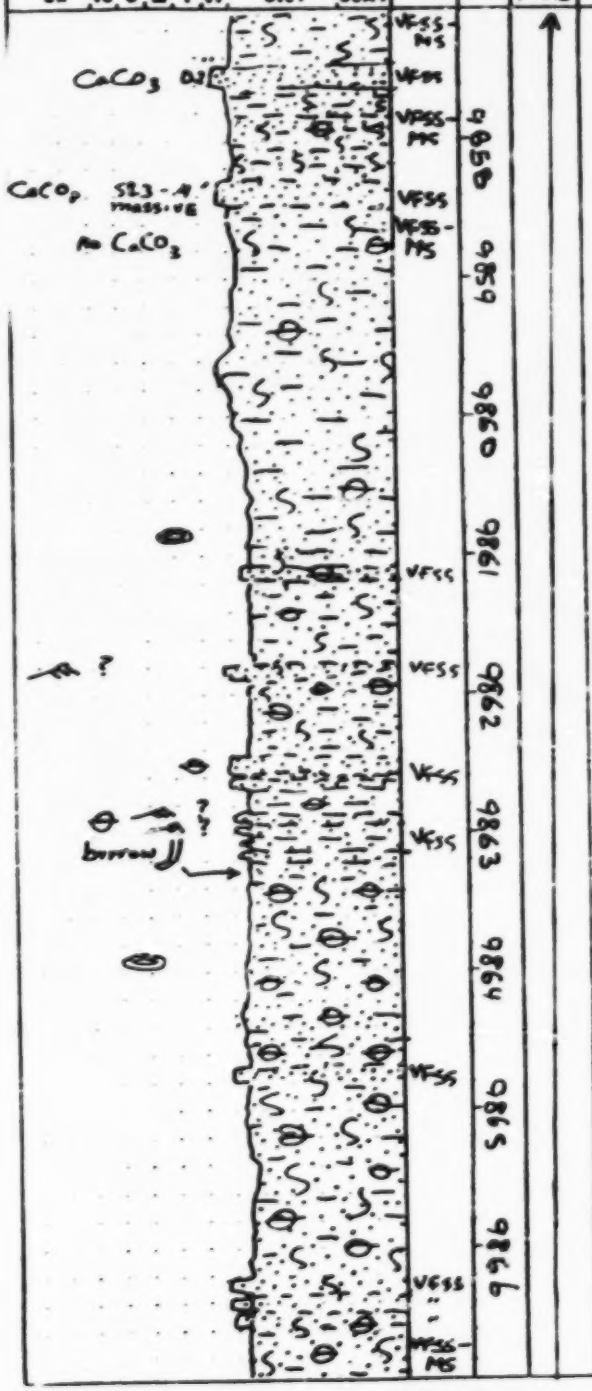
15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORP., 9794-9877.1 ft depths



CORE MISSING →

9857 TO 9861 FT

15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO. WY BUCKHORN PETROLEUM CORE 9794-9877.1 ft depths



9857-67' AS BIOTURBATED VFSS WITH MS ABOVE. SLIGHT DOWNWARD DECREASE IN BIOTURBATION; MORE OF THE HORIZONTAL BURROWS ARE PRESERVED, INCREASED PRESERVATION OF MS LAMINAE RESULTS IN WISPY APPEARANCE. THIN 0.4-0.9' THICK CARBONATE CEMENTED TIGHT LT-GY VFSS STRINGERS. VFSS INTERNAL STRUCTURE PRESERVED TO MODERATELY PRESERVED; LAMINAR TO (OSCILLATION?) RIPPLE LAMINATED.

9860.75' CARBONATE-WALLED HORIZONTAL BURROWS 0.1" DIAMETER

9861.1-61.15' MASSIVE BIOTURBATED LT-GY VFSS, MINOR CARBONATE CEMENT.
9861.8-61.82' BIOTURBATED LT-GY VFSS LENS. RIPPLE LAMINATED

9862.5-63.55' (1.05') THIN 0.2 TO 1" THICK SS STRINGERS AND LENSES IN BIOTURBATED MED-GY TO TAN-GY VFSS-MS. VFSS ARE CLY TO CARBONATE CEMENTED. POSSIBLE RIPPLE LAMINATION.
9863.55-67' AS BIOTURBATED VFSS-MS ABOVE. ABUNDANT HORIZONTAL BURROWS 0.02-0.1" DIAMETER, SS-FILLED

9864.75-64.8' SS STRINGER AS 9863' ABOVE.

9866.25-66.3', 9866.4-66.46', 9866.5-66.52'. SS STRINGERS AND LENSES AS ABOVE. INTERNAL STRUCTURE DESTROYED, MAY HAVE BEEN RIPPLE LAMINATED. LOWER CONTACT DEPOSITIONAL ON RIPPLES.

CORE MISSING -- 9862.1-62.5' 0.3' CORE MISSING

CORE NUMBER C 302

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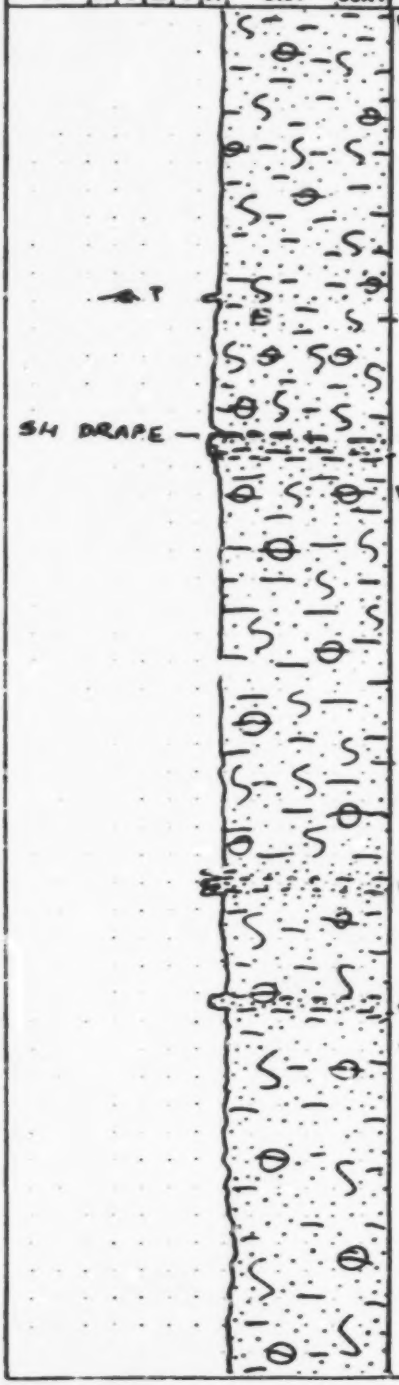
PAGE 7 OF 7

9867 TO 9877 FT

15-30 SCOTT FEDERAL SW SE SEC. 30, T 36 N, R 71 W 5,077 ft kb
CONVERSE CO., WY BUCKHORN PETROLEUM CORP., 9794-9877.1 ft depths



DESCRIPTION

9867.77' AS ABOVE RED-GY VFSS-MS. EXTENSIVELY BIOTURBATED WITH HORIZONTAL 0.02-0.08" DIAMETER BURROWS. OTHER STRUCTURES LISTED BELOW AND TO LEFT. THIN CLY AND CARBONATE CEMENTED LT-GY VFSS STRINGERS AND LENSES ARE MAINLY RIPPLE LAMINATED.

9870.2' " THICK DK-GY MS DRAPE OVER MASSI. 4" CARBONATE CEMENTED LT-GY VFSS.

9873.35-73.65' RIPPLE LAMINATED LT-GY VFSS STRINGERS. LAMINAE DISRUPTED BY COMPACTION AND BIOTURBATION.

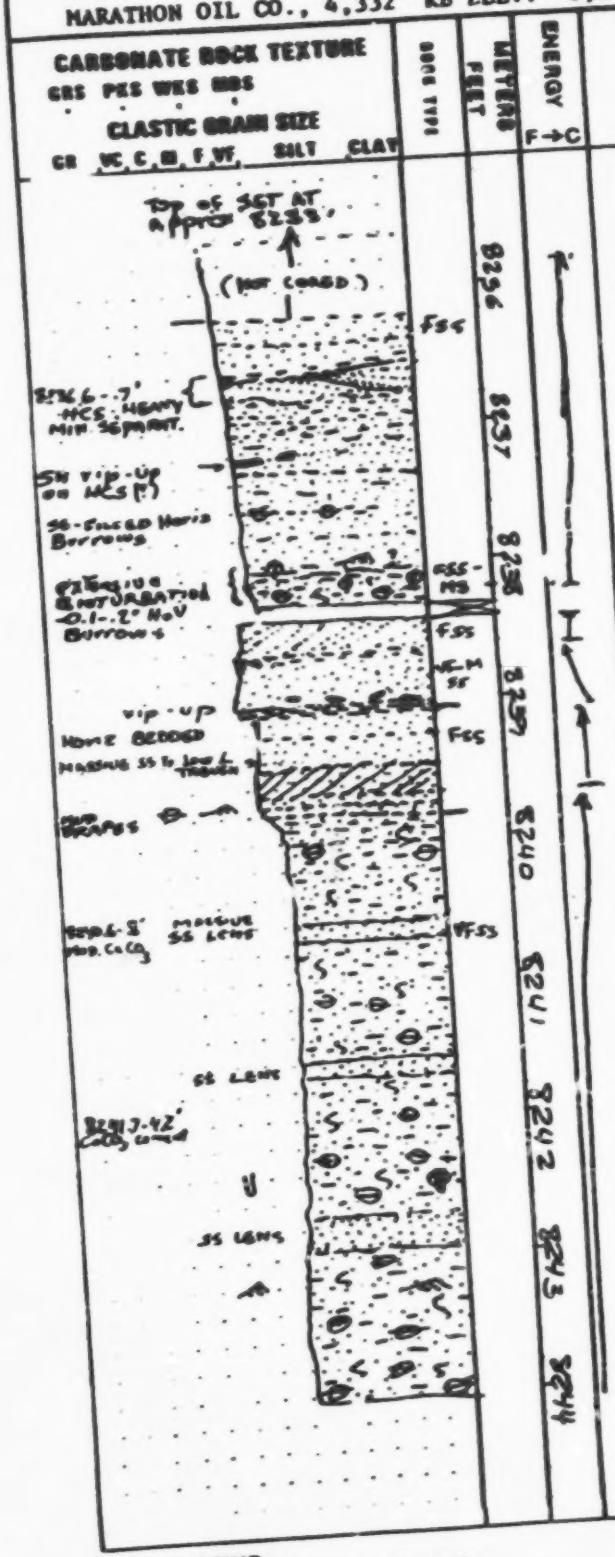
9874.2-74.25' MASSIVE LT-GY VFSS.

CORE MISSING --

CORE NUMBER A844

8236.2 TO 8244 FT

1-11 UCROSS STATE, T52N, R81W, Sec. 11, JOHNSON CO., WYO.
MARATHON OIL CO., 4,332' KB ELEV. 8,236-8,270' CORE DEPTHS SUSSEX



8236.2-38.2' (2') VLT-GY F SORTED CLEAN SA FSS. TIGHT. ABUN CaCO3. ABUN 0.01-0.02" THICK MS DRAPES. BEDDING IS HORIZONTAL TO SUB-PARALLEL LOW ANGLE (UP TO 10°) OR INCLINED MS DRAPES. CONTACTS NON-EROSIONAL OR MS. MINOR MS RIP-UP CLASTS. MOD CHLORITE AND GLAUCONITE. BIOTURBATION PRESENT ONLY AT BASE OF UNIT; 0.2 DIAMETER HORIZ BURROWS IN MS-LAMINATED FSS.

8238.4-38.65' LT-GY PLANAR-TABULAR FSS. 40° BEDDING DIPS. NO CARBONATE. CLEAN. LOW CLY CONTENT. UNIT FINES UPWARD

8238.65-39' 10° DIPPING TROUGH X-BEDDED CLEAN FSS. F SORTING. SCOUR CONTACTS. MS RIP-UP CLASTS AT BASE. MS DRAPES AT TOP AND BASE. SS RIPPLES NEAR BASE

8239-39.8' (0.8') SB-SA FW SORTED LT-GY FSS. MASSIVE TO 20° PLANAR-TABULAR BEDDING. NO CaCO3. TIGHT SS WITH KAOLINITE. MOD. GLAUCONITE AND CHLORITE. MINOR 0.05-0.2" MS DRAPES

8239.8-44.8' (4.2') FW SORTED SB LT TO MED-GY VFSS WITH ABUNDANT BIOTURBATION AND THIN 0.01"-0.1" MS DRAPES. ORIGINAL BEDDING DESTROYED; RELICT HORIZONTAL TO SUB-HORIZONTAL BEDDING. BIOTURBATION HORIZONTAL WITH MINOR SS-FILLED VERTICAL (SKOLITHOS-TYPE) BURROWS IN MS DRAPES. BEDDING CONTACTS NON-EROSIONAL. THIN 0.1-0.2" THICK CLEAN MASSIVE SS LENSES. MS LOADING AND COMPACTION FEATURES. ENERGY INCREASES UPWARD.

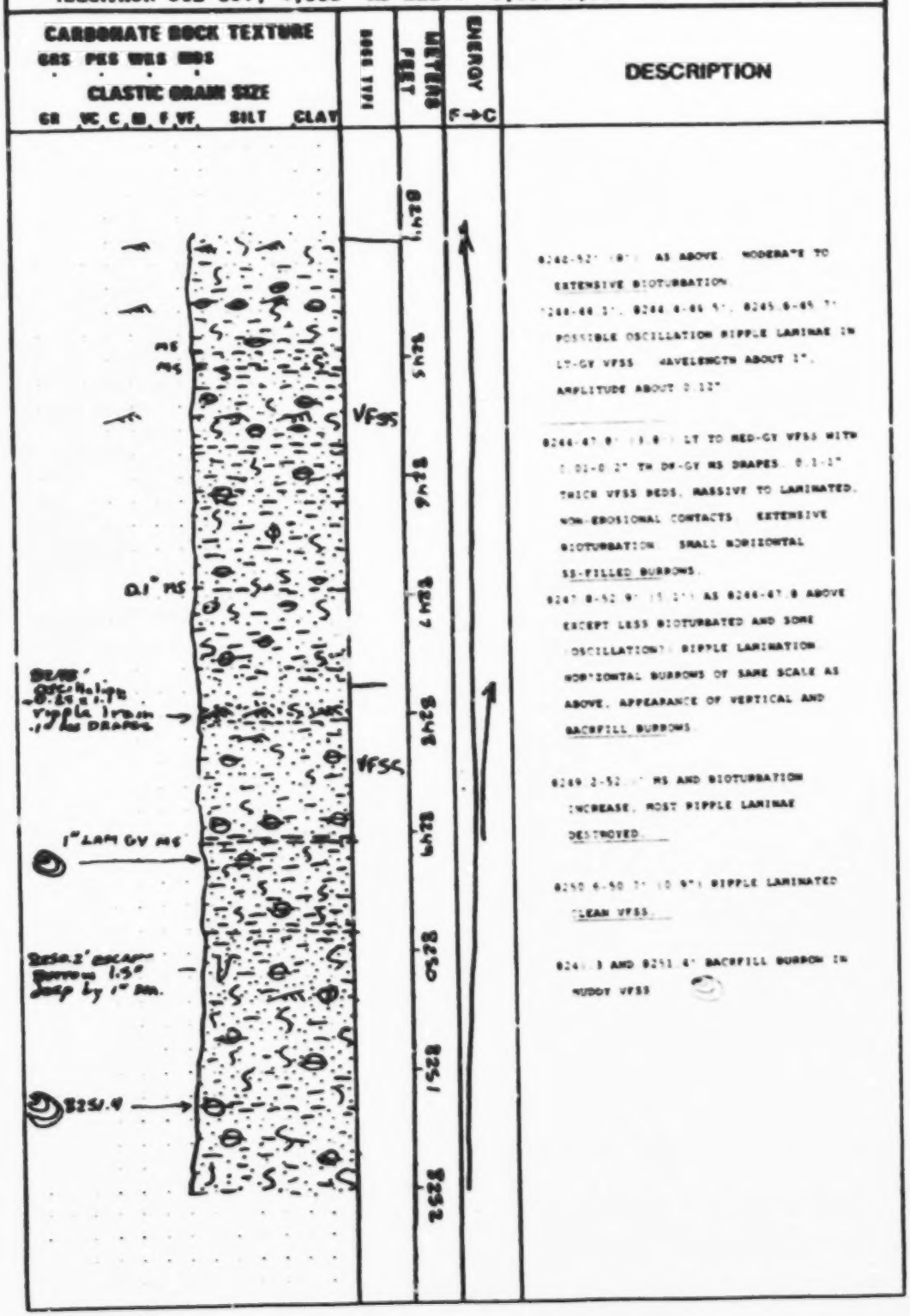
8241.2' POSSIBLE RIPPLE LAMINAE.

CORE MISSING — 8237.2'-39' 0.93'
8239-39.8' 0.15'

CORE NUMBER A644

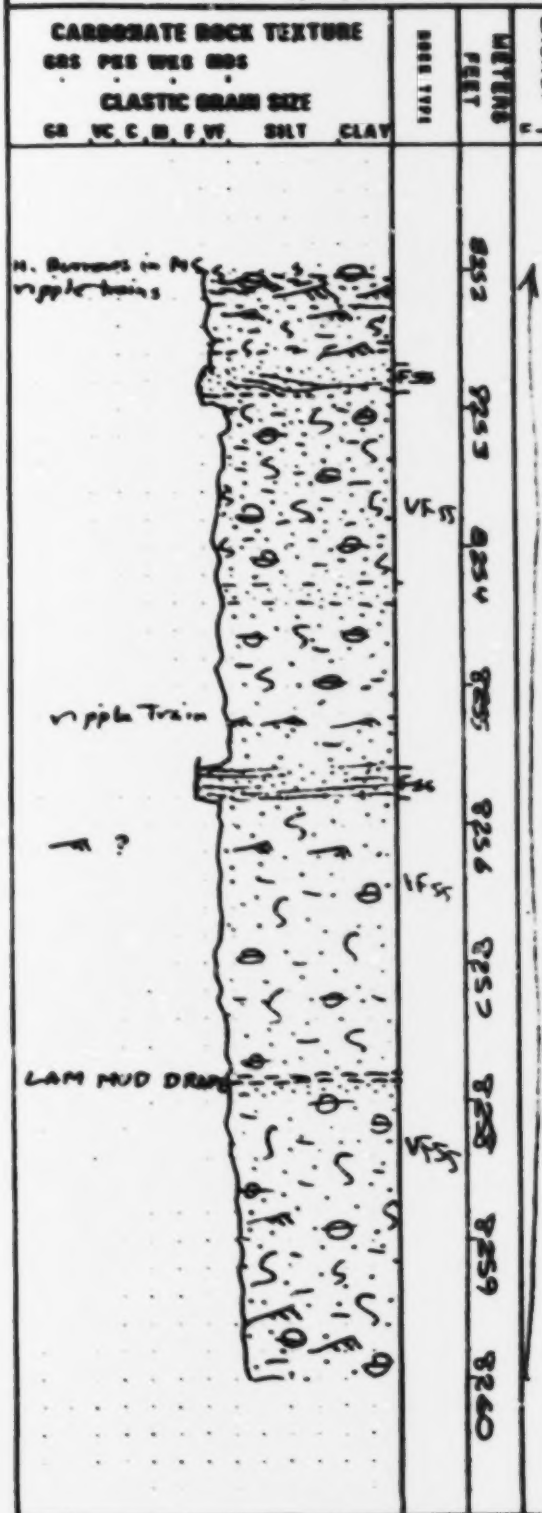
8244 TO 8252 FT

1-11 UCROSS STATE, T52N, R81W, Sec. 11, JOHNSON CO, WYO.
MARATHON OIL CO., 4,332' KB ELEV. 8,236-8,270' CORE DEPTHS SUSSEX



8252 TO 8260 FT

1-11 UCROSS STATE, T52N, R81W, Sec. 11, JOHNSON CO., WYO.
MARATHON OIL CO., 4,332' KB ELEV. 8,236-8,270' CORE DEPTHS SUSSEX



CORE MISSING – 8253-8254' 0.5' MISSING

CORE NUMBER A844

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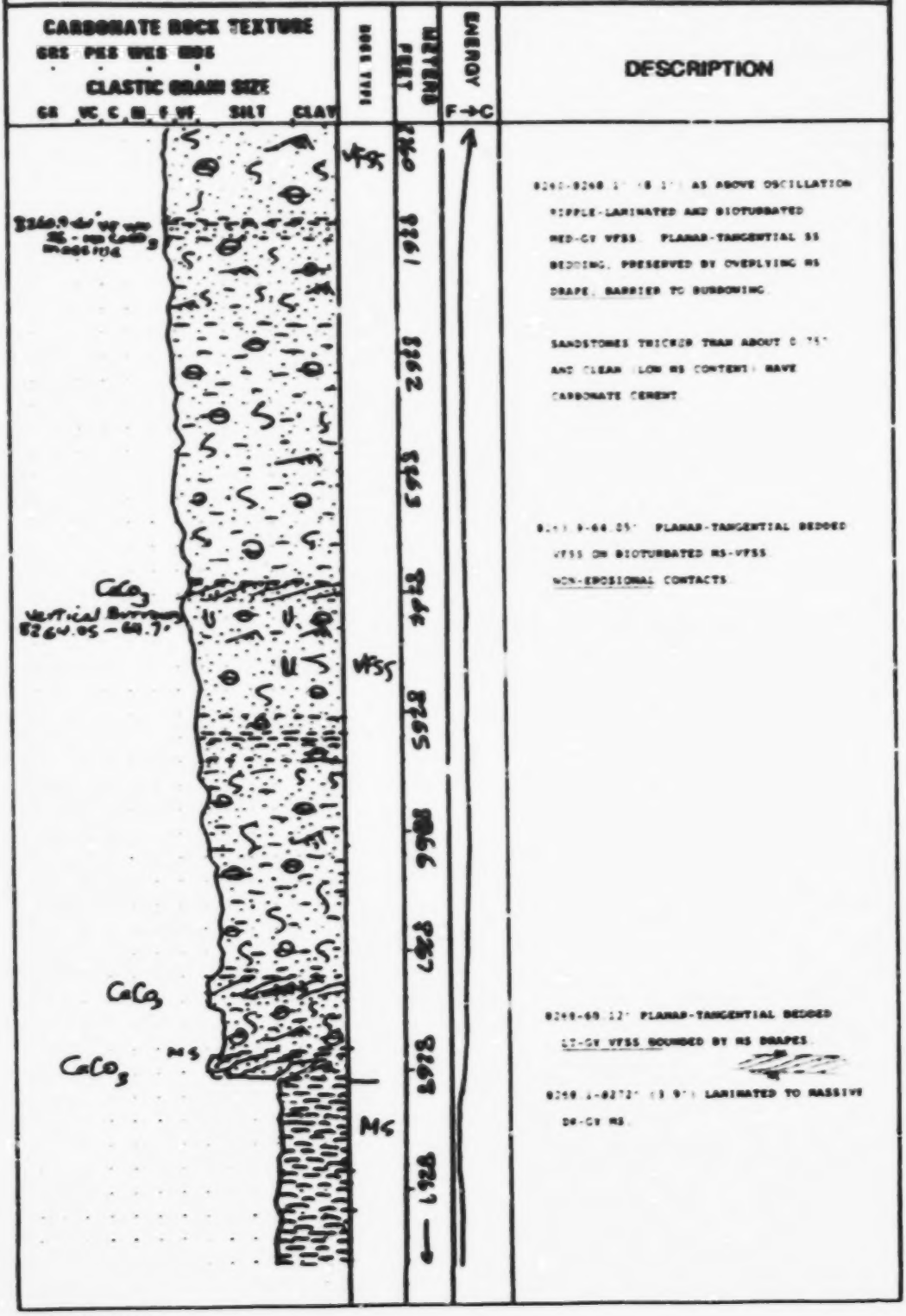
8260 TO 8272 FT

1-11 UCROSS STATE, T52N, R81W, Sec. 11, JOHNSON CO., WYO.
MARATHON OIL CO., 4,332' KB ELEV. 8,236-8,270' CORE DEPTHS SUSSEX



CORE MISSING —